FLIGHT, FEBRUARY 9, 1939

FIRST AERO WEEKLY IN THE WORLD

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FLIGHT

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The AIRCRAFT ENGINEER

No. 1572
Vol. XXXV

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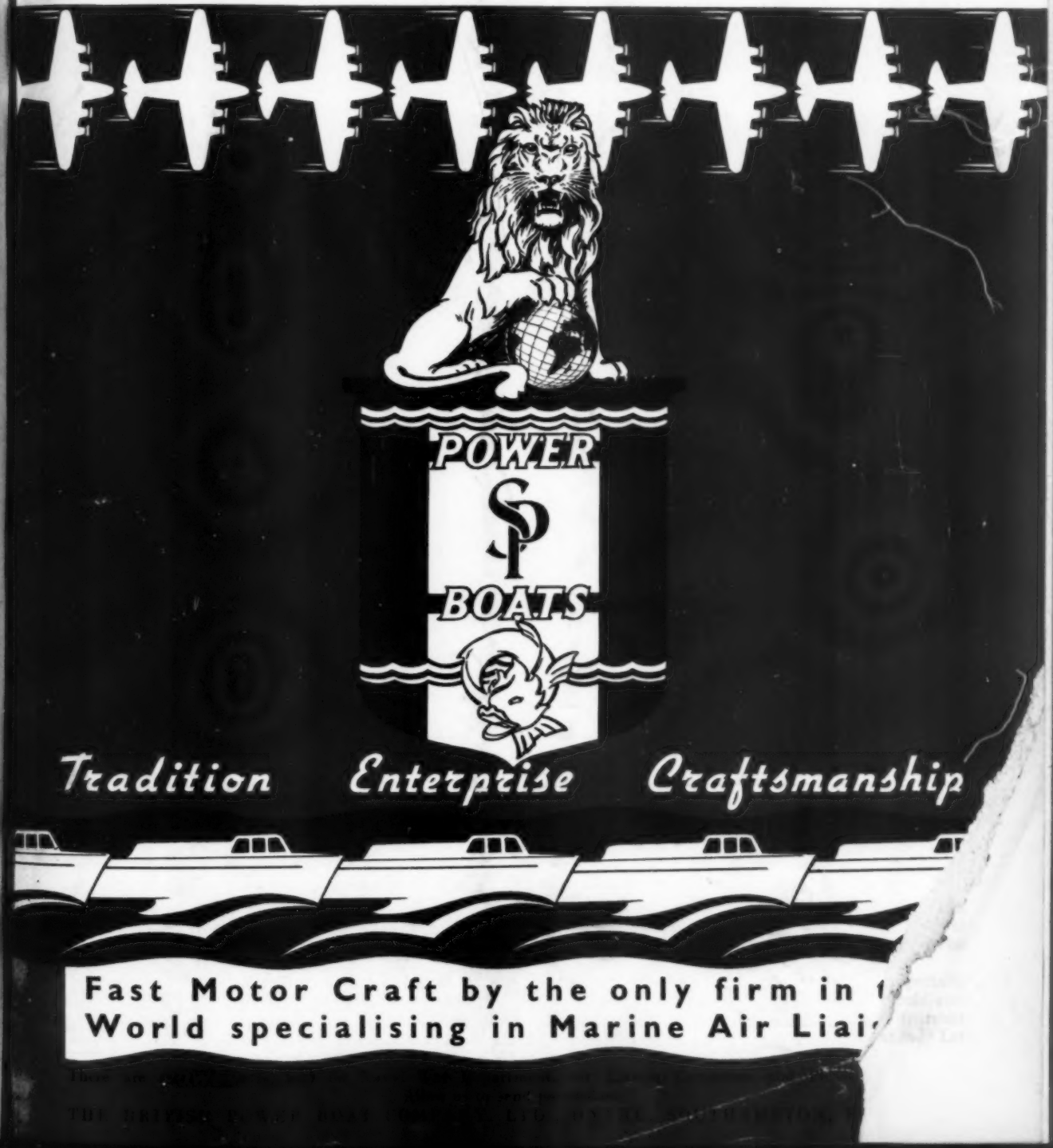

The "Bristol" Blenheim is a high-speed medium bomber, the standard equipment of many squadrons of the Royal Air Force. Of all-metal stressed-skin construction, with twin "Bristol" Mercury engines, it is a high-performance aircraft of great striking power.

"Bristol" BLENHEIM BOMBER

OL AEROPLANE CO. LTD., FILTON HOUSE, FILTON, BRISTOL.

FLIGHT
The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH

Chief Photographer JOHN YOXALL

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The Outlook

A Disturbing Thought

NOT once, but many times, has *Flight* expressed misgivings about the supply of aircraft for the Army in time of war, and last week the full seriousness of the situation was frankly brought into the open by Group Captain A. J. Capel, D.S.O., D.S.C., in a paper read before the Royal United Service Institution. The army co-operation squadrons will accompany the Army as a matter of course, but they can only deal with tactical reconnaissance for some fifty miles from the front line. Strategical reconnaissance, which must be carried out up to the range of the aircraft, say, for 500 miles, would have to be the work of specially trained bomber squadrons. Fighter squadrons would also be needed by the Army for obvious reasons. This air component of the Army's field force would have to be drawn from the force now allotted for the air defence of the country. The lecturer said that only the Cabinet could decide what number of squadrons should be taken from the defence force to accompany the Army overseas, and, of course, the Cabinet would consult the Chiefs of Staffs Committee. If it were felt that no bomber and fighter squadrons could be spared from air defence, then the Army would for the time being be unable to move overseas.

Shackling the Army's Sword-arm

WE may grant that, to all appearances, a British victory in the next war will depend more on the action of the Navy and the R.A.F. than on that of the Army. But it is inconceivable that there would not be need to send an Army expeditionary force overseas; and it is a disturbing thought that the Army should be immobilised by the lack of its air component.

One can imagine the wrangling that would go on in the Chiefs of Staffs Committee, the Chief of the Imperial General Staff protesting that the war could not be won unless the Army attacked such-and-such a point, while the Chief of the Air Staff might object that he could not possibly spare a single fighter squadron for fear London might be badly damaged by enemy bombers, and that all his bomber squadrons were none too many for his counter-attack. One may also picture the rage of a bombed city if it learnt that some of its air defenders had been sent overseas, and likewise the indignation of the people in general when it became known that something important had been lost because the Army was kicking its heels on Salisbury Plain and could not move to meet the enemy. We should not envy the members of the Cabinet, who are all laymen in military matters, in having to decide between the disagreeing experts.

Possible Solutions

SOME may say that one solution of the difficulty would be the appointment of a Minister of Defence, who would decide between the Chiefs of the Staffs. That would only transfer the responsibility from a body of laymen, i.e., the Cabinet, to a single layman—for the Defence Minister would certainly be a civilian.

We should rather urge that the only way to avoid this difficulty is by planning ahead in peace time, and allotting so many fighter and so many bomber squadrons for permanent service with the Army. We may recall that when the controversy over the Fleet Air Arm first became acute the Balfour Committee laid it down that the R.A.F. must not withdraw units from naval service without the special consent of the naval authorities. A similar plan ought, we suggest, to be adopted for the Army.

Already certain bomber squadrons have been specially trained in strategical reconnaissance, and it would certainly be hard for the Chief of the Air Staff to resist the claim of the Army on those particular units. Let

THE OUTLOOK (CONTINUED)

this principle be expanded, and other R.A.F. squadrons be similarly earmarked and trained, and let the Air Council plan the air defence of the country on the understanding that it will not be able to use the special Army squadrons unless the War Office gives special permission. Only on those lines can we see a chance of Britain being able to exert her full power if war should unfortunately be forced upon us.

A Record of Achievement

SOME indication of the kind of results with sleeve-valve engines which single-cylinder research has proved attainable were quoted by Mr. A. H. R. Fedden in his lecture to the R.Ae.S. and I.A.E. last Tuesday. After making corrections for the fact that the blower used in the tests was separately driven, the figures obtained were: B.M.E.P. of 276 lb./sq. in at 2,400 r.p.m., and 245 lb./sq. in. at 3,000 r.p.m.; the corresponding powers per square inch of piston area were 5.4 and 6.0 respectively. "The test," Mr. Fedden said, "was inconclusive, because *the limit proved unattainable with the supercharger available.*" While it does not follow that the single-cylinder test results are immediately obtainable in a complete engine, the figures do show how promising is the sleeve-valve field. And they make one realise how great is the debt of gratitude which the aviation community, and, indeed, the nation, owes to the courage of Mr. Fedden and his directors, and to the Air Ministry for its part, for their perseverance in a field of research which has placed Great Britain ahead of all competitors in this particular branch of engineering.

That these results have not been come by without effort was brought out by Mr. Fedden's mention of the fact that the Bristol Company has carried out something like 35,000 hours' running with single-cylinder test units, and about 14,000 hours' running on the four complete engine types, Aquila, Perseus, Hercules and Taurus. And there are still people who wonder why aero engines are expensive!

Mr. Fedden admitted in his paper (which we shall be publishing next week) that there are a few engine layouts to which the sleeve-valve drive cannot well be applied; he foresaw its application to the multi-bank radial, the X and the H formations. As the modern tendency seems to be towards these formations, even with poppet valves, the future of the sleeve-valve appears assured.

Too Sensible?

MONSIEUR GEORGES HOUARD, Editor of our greatly valued French contemporary *Les Ailes*, has always been a courageous man. What is more to the point is that he is also a very fair-minded man. No British achievement in the air has ever failed to draw from M. Houard its due appreciation; and that was especially so at a time when such appreciation of anything not French was likely to be unpopular in French circles.

When Pierre Cot played ducks and drakes with the French aircraft industry and drove out of it such pioneers as the Farman brothers, who refused to be nationalised, Georges Houard warned the French people of the dire consequences. That he was right has been abundantly proved by the lamentable fall in aircraft production which has taken place since. So much so that M. La Chambre, the present French Air Minister, admitted recently that the best monthly French production figures were only 80 aircraft from the whole industry. That figure is probably equalled by more than one British aircraft factory.

That France has, in the circumstances, decided to order aircraft abroad is not to be wondered at. M. Houard rather doubts the necessity, but, he argues, if France *has* to buy aircraft abroad, what would be more natural than to buy them from her old friend and ally England? He knows all the objections. In case of war Curtiss and Koolhoven could supply aircraft, England could not. But his answer to that is that in case of war everyone would have to rely on himself for supplies anyway, and it would not matter whether France failed to get her foreign aircraft from America or failed to get them from England!

The suggestion which M. Georges Houard makes is that France should order a few Hawker Hurricanes, have them delivered by air, and set about obtaining the licence and equipping works for their production at the same time. That is an eminently sensible suggestion. In fact, so sensible is it that it is almost certain to be turned down.

Any future war would see Great Britain's air arm operating largely from French aerodromes, and the advantages of identity of fighter types in the two countries are too obvious to need stressing. And, anyway, we are half-way towards that ideal in that the Rolls-Royce Merlin is likely to be built under licence in France before long.

Forthcoming Events

FEBRUARY.

Thurs., 9th. R.Ae.S. Portsmouth Branch Lecture: "Atlantic Crossings by Empire Boat," by Capt. A. S. Wilcockson.

Fri., 10th. Lancashire Aero Club: Annual Dance, Grand Hotel, Manchester.

Sat., 11th—Sat., 25th. Edinburgh Aircraft Exhibition, Waverly Market.

Mon., 13th—Sat., 25th. Glasgow Aircraft Exhibition, McLellan Galleries.

Tues., 14th. R.Ae.S. Students' Section Lecture: "Ignition," by F. R. F. Ramsay.

R.Ae.S. Isle of Wight Branch Lecture: "Past, Present and Future in Aviation," by Sir Alliott Verdon-Roe, O.B.E., M.I.Ae.E., F.R.Ae.S.

Thurs., 16th. R.Ae.S. Lecture*: "Ignition Problems," by Dr. G. E. Bairsto, M.I.E.E., F.Inst.P.

Manchester Civil Air Guards: Dance, Sale Lido.

R.Ae.S. Portsmouth Branch Lecture: "Steel Tubes for Aircraft," by Walter Hackett.

Fri., 17th. Cinque Ports Flying Club: Annual Dinner and Dance, Majestic Garden Hotel, Folkestone.

Sat., 18th. Rugby: R.A.F. v. Royal Navy at Twickenham.

Fri., 24th. York and Leeming Flying Club: Annual Ball, Harrogate.

D.H. Technical School: Annual Ball, Hyde Park Hotel, Knightsbridge, 9 p.m.

Tues., 28th. Hampshire Aeroplane Club: Annual Dinner and Dance, South Western Hotel, Southampton.

MARCH.

Thurs., 2nd. R.Ae.S. Lecture*: "Testing Stability and Control," by Ing. A. G. von Baumhauer.

Thurs., 16th. R.Ae.S. Lecture*: "Relative Merits of Carburetters and Direct Petrol Injection," by J. E. Ellor, F.R.Ae.S., and F. M. Owner, F.R.Ae.A.

APRIL.

Thurs., 20th. R.Ae.S. Lecture*: "Possible Steel Developments," by Dr. T. Swinden, F.R.Ae.S.

* All these lectures take place at 6.30 p.m. at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

AERODROME EQUIPMENT on SHOW

Some Impressions of Last Week's Exhibition in London

Illustrated with "Flight" photographs.

IN last week's issue we gave a detailed summary of the exhibits at the show organised by the Aerodrome Owners' Association, compiled from information furnished in advance by the exhibitors themselves. In the following pages are personal impressions gained by members of "Flight's" staff, who have concentrated on outstanding points of interest rather than attempted to review each exhibit in detail.

Papers read at the Conference are summarised on pages 136-138.

A general view down one of the aisles, with the *Flight* stand on the right.

THE OPENING CEREMONY

THE airport conference and exhibition organised by the Aerodrome Owners' Association was opened officially on Wednesday, February 1, by the Secretary of State for Air, Sir Kingsley Wood, who paid a warm tribute to the foundations laid by his predecessor, Lord Londonderry, who is now president of the A.O.A. He recalled their work together in the days when Lord Londonderry was Air Minister and Sir Kingsley Wood was Postmaster-General.

Sir Kingsley Wood referred to the good work done by the A.O.A. in the negotiations with the Air Ministry. Last October a new scale of aerodrome charges was decided, and the new regulations were now being drafted. He hoped the Order in Council would be issued next month. Already the new scale of charges had been introduced voluntarily at several aerodromes.

The Air Minister expressed the hope that compensation for the use of aerodromes by the Volunteer Reserve would soon be settled satisfactorily; he admitted inequalities in the past. Lighting schemes at certain main aerodromes were being drawn up, and others would follow. While referring to the Volunteer Reserve, Sir Kingsley Wood said that 23 more centres would be required in connection with the expansion, and arrangements would be made for a fair rent to be paid. He concluded by expressing the hope that it would soon be possible to devote their energies to the proper sphere of flying—civil aviation.

Mr. C. M. Newton (the retiring chairman of the A.O.A.), in proposing a vote of thanks to the Air Minister, recalled that he had opened nearly all the recent civil aerodromes. He always arrived by air, and often flew through weather which he (Mr. Newton) would not care to face. He welcomed the new arrangements for training service personnel at civil aerodromes. He reported that the Maybury recommendations for aerodrome dimensions had also been settled. This would help a lot, and aircraft manufacturers now would have to build aeroplanes for these dimensions.

Mr. J. U. Primrose (the new chairman) referred to Sir Kingsley Wood as "our greatest film star," and hoped he would find it possible to visit the best aerodrome in the country, that at Perth. To this Sir Kingsley Wood replied that he would be glad to visit Scotland. He recalled that as P.M.G. he had become popular with Scotsmen by introducing the 1s. telephone call after 7 p.m.!

At the opening: Sir Kingsley Wood is speaking, and left to right are Sir Charles Bruce Gardner (chairman of the S.B.A.C.), Mr. J. U. Primrose (the new chairman of the A.O.A.) and Lord Londonderry (president).

ROUND the STANDS

INCORPORATED in the name-block of the AEROGRAPH CO., LTD., is the claim: "The inventors and pioneers of spray painting."

Unlike some firms who are first in any particular field, this one does not rest on its laurels and allow younger, progres-

New Marconi equipment: On the left is the Marconitrack ultra-short-wave beacon receiver; it will be noticed that all the components are small so that they can be conveniently disposed in the aeroplane. On the right is the ultra short-wave approach transmitter and in the centre a remote control unit.

sive competitors to overtake it. New types of spraying equipment, it appears, are constantly being evolved to keep pace with (and sometimes anticipate) new requirements.

For instance, Mr. L. Busserau (Aerograph Southern sales representative) showed us a spray-gun, beautifully finished like the others in the range and provided with fine adjustments; but instead of the usual short nozzle there was a long, slender, swan-necked pipe.

Actually, guns of this type are specially made for spraying corrosion-inhibitor into the cylinders of newly assembled aero engines, the swan neck being introduced through the plug orifice and allowing every part of the cylinder and head to be evenly sprayed. A small sight-glass allows an equal amount to be metered to each cylinder in turn.

Aerograph, too, have developed a range of special camouflage-spraying equipment.

* * *

A REALLY massive two-stage three-cylinder air-cooled compressor for spraying plant was shown on the stand of AIR INDUSTRIAL DEVELOPMENTS, LTD. On this pump the two outside cylinders—the arrangement is not unlike the top half of a radial aero engine—compress the air at 50 lb./sq. in. into a special air cooler or radiator and from it into the centre cylinder, which finally compresses the air to 100 lb. and more, if required. Also on the stand was a neat portable spray plant for use with one gun, while in the background was a selection of Binks spray guns and spray painting equipment, including filters and pressure containers.

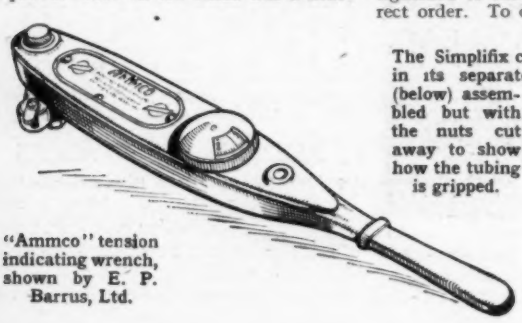
* * *

CANTEEN equipment is the speciality of ASH'S MANUFACTURING CO. (BLACKFRIARS), LTD., and demonstrations might have proved popular during the hungrier and thirstier periods of the exhibition (though one must acknowledge the utility of the organisers' perambulatoring coffee-dispensing unit).

There were illustrations of works and staffs canteens laid out and installed by the company in many of the leading aircraft factories. Not only does the firm deal with planning and installation of canteens, but it specialises in advice as regards the suitability of site, drainage, artificial ventilation, movement of stores, decoration and floor treatment, system of service and kitchen service layout.

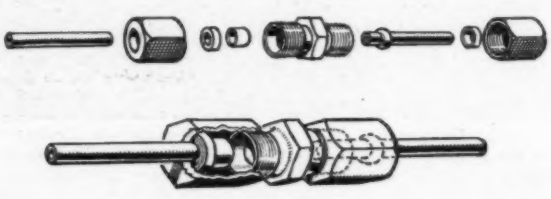
* * *

ON the stand of E. P. BARRUS, LTD., was almost everything from flying-boat anchors to petrol pumps and, as if to be even more diverse, valve refacers. The anchors shown were of the specially designed Northill folding type. Of the many lines shown we found the Ammco tension-indicating wrenches worthy of more than passing interest. Where it is essential to bolt down cylinder heads evenly, it is vital that each nut should be tightened to the same tension in its correct order. To do this without a gauge is almost impossible, but with the Ammco wrench a small, easily read gauge is mounted near its "business" end.



"Ammco" tension indicating wrench, shown by E. P. Barrus, Ltd.

The Simplifix coupling, seen in its separate parts and (below) assembled but with the nuts cut away to show how the tubing is gripped.



AERODROME EQUIPMENT ON

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THE A.O.A., anxious, no doubt, to offset the low altitude of the Exhibition ceiling by preserving some impressive vistas down the aisles between the stands, were a little perturbed when a posse of bricklayers arrived some time before the opening and proceeded to erect, on Stand No. 30, what threatened to be a factory chimney (though doubtless they were not surprised for, as "A. Viator" will tell you, wherever aerodrome equipment appears, there do factory chimneys sprout magically).

The erection, however, stopped short at eight feet or so, and in two openings were placed window frames. Inside the tower was arranged a particularly wet and violent sort of mechanical waterfall. THE B.B. CHEMICAL CO., whose stand this was, came along and glazed the windows, sealing the glass with their "Bostik" sealing compound, as used, in its various grades, for both aircraft and terrestrial windows. And, thereafter, a thirsty fly, alighting outside, could not have found sufficient water to moisten his tongue.

It was a convincing demonstration, and we were only sorry that we could not persuade two Bostik technical representatives, Messrs. J. E. Robson and H. J. O. Head, to disclose what this black, rubbery sealing stuff (which you can't tear apart) is made of. But they did use it for an emergency invisible repair to a certain well-known air correspondent's horn-rimmed spectacles. And they showed us some new flexible rubber paint, in a variety of colours. Apart from its more serious uses in aviation, one saw it as a possible safeguard for otherwise camouflaged aeroplanes that suddenly find their wheels will not retract. . . .

* * *

PORTABLE spraying plant and a wide variety of sprays formed the chief attraction on the B.E.N. stand. Perhaps it was fortunate that rules and regulations did not permit a demonstration of the company's latest spray, known as the "Varispray"—the fascination of using a controllable spray might have proved too much for some visitors. The "Varispray" has a simple control by which the width of the spray can be changed from fan to round form in operation. The gun is capable of handling all classes of spraying materials with a high rate of production.

* * *

THE continually increasing size of machines and the need in assembly shops for rapid movement, has, during the last few years, caused considerable changes in hangar design. It is a comparatively easy matter to design a build-

MEN ON SHOW (CONTINUED)

ing in which the door areas are small, but in the type of buildings which are used by aircraft operating or manufacturing companies both the door space and the free floor space must be very great indeed. Furthermore, as the erection shops and hangars are usually laid out on or beside aerodromes, which are necessarily in exposed positions, the structure must, in addition, be capable of standing up to considerable wind pressures. To-day, too, Service hangars must be designed to be quickly removable.

Few companies have more experience of the construction of hangars and aircraft factory buildings than BOULTON AND PAUL, and, even before the expansion scheme, they were responsible for many of the largest airport buildings in this country, apart from their work abroad and, in particular, in South Africa at Bulawayo and Germiston aerodromes. The exhibit at the Central Hall consisted of a series of photographs showing different examples of B. and P. work.

* * *

THERE were two conspicuous items of interest on the stand of JOSEPH BRADBURY AND SONS, LTD. The first was the G.E. aircraft lamp, and the second was an ingenious petrol washing bin.

The aircraft lamp can be described as triple telescopic, made, in the main, of chrome-molybdenum tubing. At its base is a patent gripping clutch. The lamp can be brought down to within 2ft. of the ground and it can be extended up to a height of 17ft. 6in. Its reflector can be adjusted for any position and set at any angle.

The petrol washing bin interested us for the reason that, should it catch fire by accident, a simple celluloid fuse will burn and release the spring catch, causing the lid to shut and so smothering the flames.

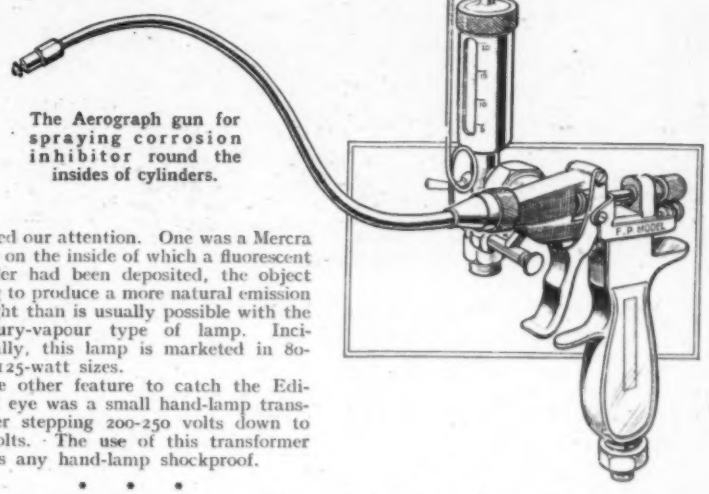
Another feature of the stand, though not quite so conspicuous, was an excellent example of a rigid portable workbench.

* * *

SOIL stabilisation has become a recognised science, and on the BRITISH BITUMEN EMULSIONS stand we were able to learn first-hand from Brigadier C. H. Haswell about the latest developments concerning the methods now employed to convert mud into a useful, firm surface. It was nearly ten years ago that Brigadier Haswell made some experiments in India with bitumen applied to surface soil. The success of these experiments, coupled with a visit to America, where similar research was going on, convinced him that there was a lot to be learned. Since then soil stabilisation has become a recognised process. Samples of the soil to be stabilised are analysed. To ascertain the mechanical strength, the ratio of aggregate (small stones, etc.) to that of clay is worked out. If there is too much clay more aggregate is added. Then, in the case of this firm, Loxnix—a bituminous emulsion—is applied. The microscopic particles of bitumen surround the particles of clay. When dried the clay and bitumen form a firm and hard substance virtually impervious to water and which locks the aggregate into a mechanically strong whole—a fact which was borne out by the two brick-like samples of soil taken from Prestwick and Karachi aerodromes.

THE B.T.H. stand was one of the warm spots in an otherwise rather draughty hall, for the heat generated by the many different types of Mazda and Mercra lamps was the next best thing to sun-ray treatment. During a course of "treatment" the finer points of the new Mazdalux 10 light was explained to us. This light is particularly suitable for lighting paths and both interiors and exteriors of hangars. In this light it is possible to use a horizontal-burning Mercra lamp which gives a controlled beam and eliminates glare.

Two other features on this stand attracted our attention. One was a Mercra lamp on the inside of which a fluorescent powder had been deposited, the object being to produce a more natural emission of light than is usually possible with the mercury-vapour type of lamp. Incidentally, this lamp is marketed in 80- and 125-watt sizes.



The Aerograph gun for spraying corrosion inhibitor round the insides of cylinders.

The other feature to catch the Editorial eye was a small hand-lamp transformer stepping 200-250 volts down to 12 volts. The use of this transformer makes any hand-lamp shockproof.

* * *

TO fit heating radiators in the roof of a building seems, at first sight, rather like putting the cart before the horse.

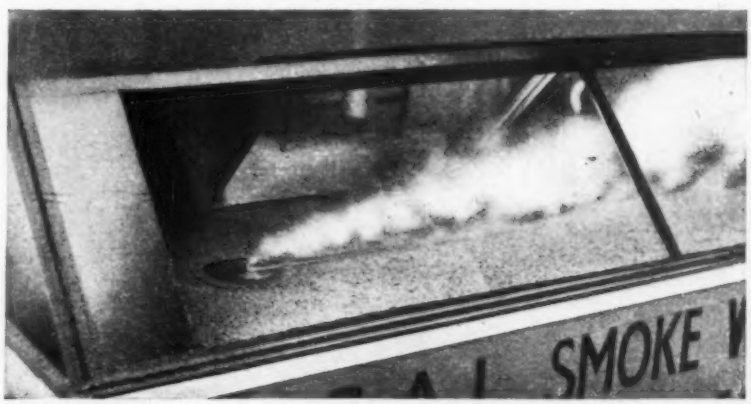
But, as they explained on the stand of the BRITISH UNIT HEATER AND RADIATOR COMPANY, it depends on the radiator. The "Copperad" unit heaters in which this firm specialise are very different from the orthodox variety. The size of an average radio set, each radiator consists of a finely made heating unit of solid-drawn flattened copper tubes, interlaced with continuous copper fins. There are also header tanks. At the back of the radiator is an electric motor and fan; at the front are downward-pointing louvres. Installed in the roof trusses of a building, and supplied with hot water or steam, these heaters virtually reverse the usual convection-heating process. Instead of drawing cold air across floors, warming it, and sending it up to waste in the roof, the "Copperad" heater takes its air from the roof area, warms it, and directs it positively downwards to the points where it is most required.

It is claimed that warming-up is far quicker than with orthodox systems and that even large buildings can be brought up to the required temperature in an hour. The space-saving advantages are obvious, and the number of transport and industrial undertakings which have installed the system in their premises bears witness to its efficiency.

* * *

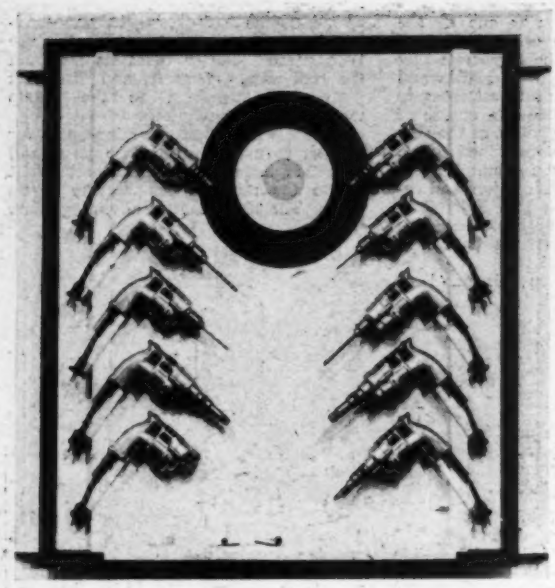
THE firm of BROWN BROTHERS (AIRCRAFT), LTD., contented themselves with a neat display of aircraft maintenance equipment. Chief interest centred round the Rothswan Aerojacks, ranging from 18in. models with capacities up to 1 ton to 23in. models for work up to 5 tons.

Of the tools and precision instruments we were shown the Partington magnifier and the Aggra screw gauge. The former is, in effect, a hand torch with a lense so mounted that when an object, such as a piece of steel, is examined for a flaw the light from the torch illuminates the object from the correct angle.

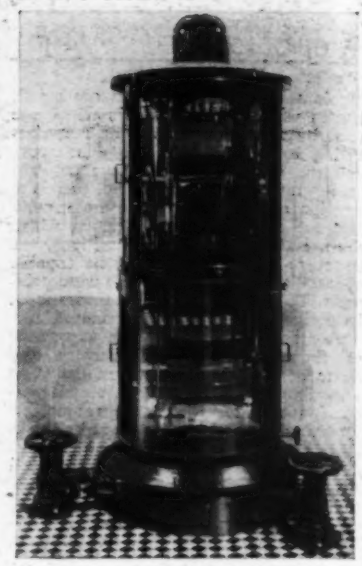


The cleverly arranged working model of the G.A.L. smoke wind indicator.

AERODROME EQUIPMENT ON SHOW (CONTINUED)



(Left) Simple but effective—the wall panel at the back of the Desoutter Stand.



(Right) This G.E.C. floodlight is designed for mounting as a mobile unit. Two 2,000-watt lamps are installed.

SOMEHOW, to sit on the stand of BUTLER'S, LIMITED, was to conjure up childhood memories—the pride in owning our first electric torch. Here one could experiment with all types of searchlight and signalling spotlights. One, the Mark II Spotlight, is both light and handy and incorporates a sighting tube and a quick-action shutter device. The lamp is quickly detachable from its mounting and can be used away from its mounting, for inside the back of the lamp is a spool round which 20ft. of heavy rubber-covered cable is wound.

There were also two lamps of an entirely different type, for use in aircraft as landing lamps. They are fitted with a remote control for adjusting the angle of the beam. Given good atmospheric conditions, it is claimed that this type of lamp has an effective beam of over 1,000ft.

* * *

SET in the centre of the CALLENDER'S CABLE AND CONSTRUCTION CO. stand was a superb model in wire of one of the Callender-Hamilton unit construction hangars. This type of hangar is assembled in box girder units—many of which are interchangeable—without any special gear being necessary. In fact, comparatively unskilled labour can deal with the erection in a remarkably short space of time.

The hangars are of steel construction, covered with corrugated sheeting. They are designed to stand upward pressures of over 22 lb. sq. ft. on the roof. A protective coating of zinc is applied to all parts.

Also on the stand was a display of Kalbitum anti-corrosive paint. This material has a bituminous base designed to protect iron and steelwork.

* * *

THE business of designing boundary lights to comply with the present somewhat stringent requirements is not an easy one. Not only must the equipment be entirely watertight, but the lights must be arranged so that, in the event of accidental collision, there is no risk of fire. The CARDIFF FOUNDRY COMPANY'S "Pillar of Fire" lights consist of two main parts—the beacon proper and base-piece on which the former stands in a cone seating. The beacon is held in the upright position by three spring-loaded guys, each having a weak link, consisting of a strand of copper wire, which breaks under the force of any blow exceeding a certain load. Normally the load is fixed at ten pounds, so that immediately the beacon is touched by the undercarriage or wing of a machine the contact is broken. In actual practice, because of the position of the guys, the beacon will always fall before it has been touched.

This boundary light has another feature which should be of assistance to pilots in gauging height and position during an approach. Apart from the protected orange globe at the top, another lamp, with the help of a reflector, lights up an area on the ground some eleven feet in diameter. This area, of course, covers the usual nine-foot whitened base.

* * *

DOPES from the Cellon factory are known the world over, but on the stand of CELLON, LTD., we learnt of a new Cerrux de-oxidising primer which is used to prevent further rust corrosion where metalwork has already been attacked. Its function is a chemical one and when applied to buried rust or corrosion, it converts by chemical reaction the "live" rust particles into an inert compound or stable salts. Other constituents in the primer hold these salts in a film which has a slightly acid nature. Entry of moisture is prevented and any further reaction is inhibited. In view of its function, this Cerrux Primer should only be used where there remains any corrosion or embedded rust.

* * *

THE new idea in night-lighting for aerodromes is that of runway markers or contact lights, and an example of one of these was shown by CHANCE BROTHERS. Interestingly enough, neither the design nor the manufacture of these flush lights is as simple as it might first appear. Not only must the lights be completely weatherproof, but the glass must be able to withstand both the considerable loads imposed by machines and the stresses resulting from differences in temperature. In fact, the manufacture of the lens has been the major problem involved in their development.

Briefly, the runway marker scheme involves a line or lines of these flush-mounted lights, each of which has its lens designed so that the illuminated area is mushroom-shaped; in the ordinary way the full strength of the light can only be seen at approach angles of less than ten degrees above the horizontal. In order to mark the particular direction of approach, a coloured sector can be fitted on one side of the bulb so that from one direction the colour is red, while from the other it is white or yellow. The development of the contact system also involves the possible use of threshold lights to guide the pilot on to the start of the runway in conditions of bad visibility. In other words, at the moment when the pilot ceases to make use of bearings from the D/F station or of the signals from an ultra-short wave beacon, the visual guidance is immediately clear and unmistakable.

Chance Brothers have also developed a new type of wind indicator, the directional position of which can be more easily seen from ground level. This indicator is normally available in two forms—either with auxiliary wind vane control or for direct operation in the ordinary way.

* * *

VISITORS to the previous Airports Exhibition may recall that Mr. Charles Desoutter attracted undoubtedly the biggest crowd in the show to DESOUTTER BROTHERS' stand by demonstrating his ingenious pneumatic and electric tools—not to mention an entirely unofficial exhibit in the shape of a 1 c.c. two-stroke engine which he had built by way of a hobby.

This year there was the comparatively new pneumatic nibbler as a *pièce de résistance*. We were allowed to play with it, and now we are not completely sure that these incredibly efficient weapons from the Desoutter armoury are good for the morals of those who use them; by which we mean that they give the user an altogether inflated idea of the power of his own mind over matter. When one's previous experience of cutting sheet metal has been confined (and painfully confined) to tinsnips, it rather goes to the head to find one's self cutting jig-saw puzzles out of 18-gauge duralumin, with the cutter head of the little

AERODROME EQUIPMENT ON SHOW (CONTINUED)

2lb. tool sliding through the metal like the proverbial knife through butter. It gobbles its way forward at 2,500 nibbles a minute—which means 10ft. a minute, and you can turn the cut through a radius of an inch.

Having followed this by an innings with the "Mighty Atom" shear (2¼lb. weight, cutting 12 ft./min. in 16 s.w.g.), we began to experience an uncontrollable sheet-metal lust, and found ourselves casting hungry eyes on the oil drums next door. It seemed time to discipline ourselves with a little drill. And that only weighed 1¼lb.!

* * *

SOME interesting developments in camouflage-spraying were explained to us on the stand of KURT ERLACH, LTD., by Mr. P. W. Robertson.

One was a method of robbing roof-glass of its reflecting power without greatly detracting from the amount of light passing through it. The glass is brushed or sprayed with a special adhesive and the sand—which may be of various colours—is sprayed on lightly and evenly. Only 10 per cent. of the light passing through is stopped.

Certain of the guns in the wide Erlach range, if fitted with a 5 mm. jet, will spray the special camouflage paints—a mixture of paint and silicate which gives a sandy texture when applied.

* * *

THE range of jacks on the EPCO stand extended from seemingly frail but nevertheless immensely strong jacking trestles to a massive 5-ton jack specially designed for the Bristol Company. This jack is of welded construction and operates on the ball-crank principle with a simple hydraulic ram. The jaw pads or saddles are linked hydraulically to compensate for any unevenness in the loading.

At the back of the stand was a useful portable crane—uncommonly like a gallows of yore—and an example of the Epco degreasing plant for use with trichlorethylene.

* * *

ESAVIAN DOORS were one of the firms whose products were of far too impressive a size to bring into the Hall, so, having secured a stand with a suitably shadowy recess under some stairs, they did the next best thing and showed a film of some of their vast hangar doors in operation, folding smoothly open and shut, like the pleats of a paper fan, under the urge of an electric motor.

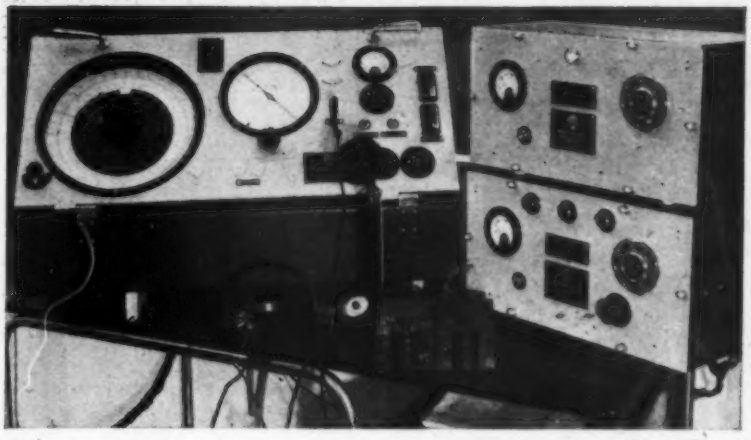
A new order for Filton, making the Bristol Company's quota of Esavian doors seven complete sets, calls for a door 312ft. wide by 32ft. high; and, when it comes to height, there is a 35ft. 8in. Esavian door at Speke.

Lately, we were told, the Air Ministry have been resurrecting some Great War aerodromes; and Esavian engineers, going down to inspect their doors installed 23 or 24 years ago, have reported them to be in need of little more than greasing.

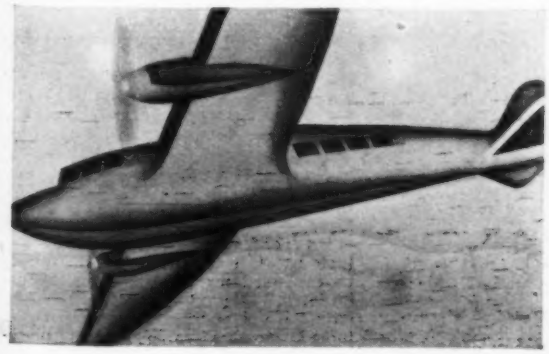
* * *

SINCE its earlier days the GENERAL AIRCRAFT smoke indicator has been redesigned, and the present electrically heated device bears little or no resemblance to that which was originally taken over from N.F.S. There is little doubt that the smoke trail provides the most accurate and easily seen form of wind indication, and the equipment, which consists of a fuel tank housed in a concrete-lined pit with an electrically heated smoke-producing unit, is inexpensive to operate and reliable so long as the jet is cleaned after every fifty hours' use or so. In the normal way one filling of the tank is sufficient for a hundred hours of use, but if the oil level falls below a certain point the device is automatically switched off so that there is no danger of damage or wastage.

The latest variation of the ideal is the provision for its illumination at night. Around the smoke "factory" itself are placed a series of flood-lighting units each of which directs a white light towards the centre of the circle and, at the same time, is fitted with red upward-shining lights which can be arranged to flash the particular aerodrome's morse signal. Apart from the fact that it is possible to make a landing solely with reference to the smoke trail and the circle of lights, this system also has the advantage of making an aerodrome absolutely distinguishable.

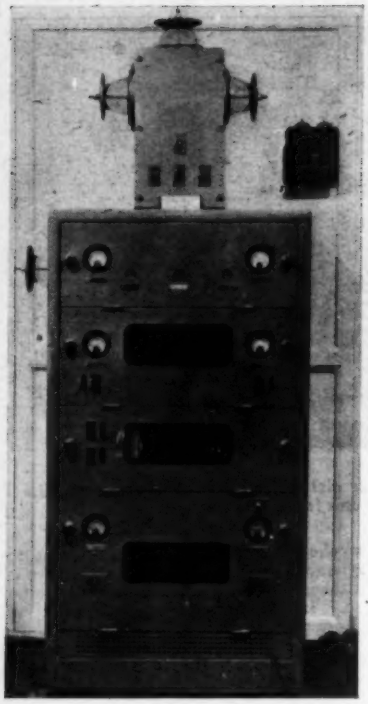


Plessey D/F receiver with large goniometer dial and single-dial tuning. On the right is the remote-control unit for the transmitter.



(Right) Bradbury aircraft inspection light, which can be raised from 2ft. to 17ft. 6in.

(Below) A mural panel on the Cellon Stand; it was spray-painted and stencilled in five "Cerric" cellulosed finishes on a groundwork of "Cerrux" synthetic finish.



The Standard omni-directional chronometer-controlled automatic beacon.

THE flush or runway marker method of aerodrome lighting, for which Mr. Vulliamy from Norman and Dawbarn has been largely responsible, is likely to become standard practice at least by those aerodromes where fogs are recurrent. The GENERAL ELECTRIC CO., LTD., is now installing a series of these contact lights at Heston airport on the lines of the blind approach run. On this stand, however, the example of a contact light which was shown was somewhat over-shadowed by the mobile floodlight—a type which is specially suitable for small aerodromes, where the expense of fitting permanent floodlights cannot be considered. In the ordinary way this light is mounted on a lorry which can be moved to any part of the aerodrome boundary according to the direction of the wind. Special means of reflector adjustment are provided and accessibility for maintenance purposes has been carefully studied.

With a comparatively small number of available aerodromes the G.E.C.'s main interest lies in the economical lighting of hangars, assembly shops and factories, and the company's stand was itself lit by one of the new types of fluorescent mercury-vapour lamps in which the usually unhappy colour of the light is largely corrected.

IT is about forty years ago since the first chemical fire extinguisher, containing sulphuric acid and bicarbonate of soda, was introduced. Ten years later carbon tetrachloride appeared. The highly efficient froth and foam so much used to-day are of comparatively recent introduction.

These things we learned on the stand of the GENERAL FIRE APPLIANCE CO., LTD. This company's large fire tenders could not, of course, be exhibited, but there was an example of the 30-gallon "Bromylene" tank on a rubber-tyred limber—as supplied, we were told, in large quantities to the Air Ministry.

The 30-gallon tank generates 240 gallons of foam and gas in combination, ejecting the stream from the spreader to a distance of 70 to 80ft.

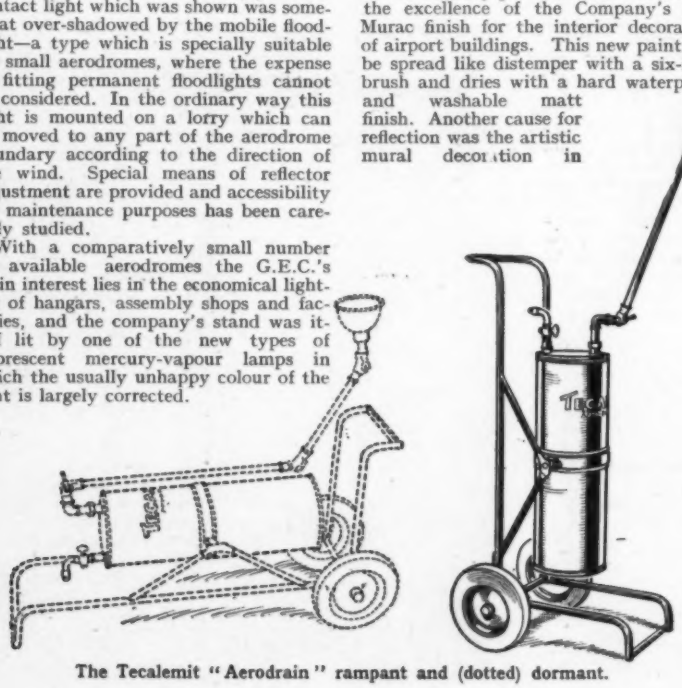
* * *

SOME types of earthenware or porous drain-pipes are, it is said, apt to be unsatisfactory when used for aerodrome purposes. There is a risk of faulty alignment at the joints, and they are apt to become crushed or displaced by heavy traffic. On the stand of HALDER CONSTRUCTION, LTD., it was possible to see clearly the advantages claimed for "Satujo" jointless pipes, which are cast *in situ*. Briefly, a bed of concrete is laid in a trench. It is shaped to form the bottom invert of the pipe. Along this invert is laid a length of inflated rubber tube of the appropriate diameter. On this tube is poured a highly porous concrete, mixed with a large grade of aggregate. As soon as the concrete has set the rubber tube is deflated and withdrawn. The trench is then filled in in the normal manner.

From this brief description it is possible to realise that the upper surface of the pipe is extremely porous—in actual fact, 48 per cent. of its area is absorbent.

* * *

HAVING lured us on to the stand of JOHN HALL AND SONS (BRISTOL AND LONDON), LTD., with the aid of a new and extremely tantalising move-the-match puzzle Messrs. St. John Plevin and D. W. Gourlay proceeded to demonstrate the excellence of the Company's new Murac finish for the interior decoration of airport buildings. This new paint can be spread like distemper with a six-inch brush and dries with a hard waterproof and washable matt finish. Another cause for reflection was the artistic mural decoration in specially (and attractively) treated glass—a sphere in which the company is as expert as it is with various painting materials.



The Tecalemit "Aerodrain" rampant and (dotted) dormant.

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ONE of the most interesting exhibits on the stand of W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., was the Henley-Sharborn relay. This is a remote-controlled switch. Its chief feature lies in the fact that the operating windings are "dead" except during the moment of operation. It has self-cleaning contacts and the main switch is automatically locked either "on" or "off." Single- and three-pole models for A.C. operation for 30 or 60 amps. capacity on the main switch and similar models for cascade operation with thermal control are all closely related to the single-pole model displayed.

* * *

HYDRAN PRODUCTS were showing their ingenious burners for oil-fired boilers. The oil, thrown from the hollow spindle of an electric motor in a whirling, conical spray, is atomised by a fan running on the same shaft but giving an air-blast revolving in the opposite direction.

Mr. R. E. Miles (general manager) emphasised that, though these burners are greatly in demand for using waste oil—and they can turn the blackest, treacliest stuff into good, honest British-to-the-backbone thermal units—plenty of people operate them on normal fuel oil.

* * *

SUCH was the confidence of the demonstrator on the stand of WALTER KIDDE AND CO. in their "Lux" fire-fighting equipment that he would eject a quantity of carbon dioxide on his clothing so that open-mouthed spectators might gaze in awe at the resultant white patch as it slowly evaporated, to leave his suit in precisely the same condition as it was before the application of the CO_2. In fact, therein lies a big feature of "Lux" equipment. Carbon dioxide, being an inert gas, does not damage any material.

* * *

ALL types of jacks, trestles and engine stands were to be seen on the stand of ERNEST LAKE, LTD. The company's latest form of jacking trestle was equipped with its own particular type of retractable undercarriage, in the form of cam-operated castors which can be easily brought into action to give easy mobility when under load.

For radial engines a simple stand has been devised by which the engine can be mounted in either a vertical or horizontal position, according to the requirements of the ground engineers.

* * *

AT the stand of THE LONDON AND MIDLAND STEEL SCAFFOLDING CO., LTD., visitors were being shown how the firm can cope with almost any problem where scaffolding is concerned, either in the hangar or factory for building and repair work, or for staging, etc., used in actual aircraft assembly.

The secret of the adaptability of their metal scaffolding for any purpose lies in Burton's patent Quickgrip tubular steel scaffolding fittings. Equally useful are their patent steel props or shores—"Burshores"—and their patent split heads—which, it may be explained for the benefit of the uninitiated, are tripod-based, height-adjustable stands, surmounted by a forked member carrying two pinch-

screws. Two pairs of the stands are used; each pair is connected by a timber baulk retained by the pinch screws, thus making, in effect, two sturdy trestles across which planks can be laid.

The advantages claimed for all these fittings in strength, safety, reduction of transport and labour cost and depreciation, are obvious.

* * *

ULTRA-HIGH frequency radio appears now to be the recommended medium for blind-approach work, and it is even being considered for navigational assistance over longer distances. The MARCONI COMPANY has recently introduced ultra-short-wave receiving equipment which has been specially designed for ease of installation. The various items in the equipment are separated so that they may be placed where most convenient, and so that there is a minimum amount of wiring.

The Marconitrack receiver shown at the Airports Exhibition has other special features, one of which is the provision of six spot-wave frequencies; no other equipment has, we believe, been so far produced with more than three. These different frequencies can be obtained immediately by the radio operator, while the pilot merely has to look after a small tuning control panel. The visual indicator used is a very simple crossed-needle dial. The directional indications are given in the usual way by a kicking movement of the vertical needle, this movement being entirely dead-beat, with no swing beyond the centre, when the machine is flying either in the dot or the dash zone. Marker beacon indications are given by coloured shutters over a permanently glowing bulb—thus doing away with the difficulties which are sometimes experienced with Neon lights.

On the stand, also, was an ultra-short wave transmitter, the series-phase aerial system of which is designed to give what amounts to an equi-signal track in one direction only. This, the firm thinks, is what is wanted in an approach beam. At the same time, the aerial system gives a very clear definition between the constant note and the "t" and "e" zones, as well as reducing lateral radiation.

* * *

ILLUSTRATED by large drawings and blueprints were the circular hangars designed by M. Mopin, a French engineer, whose English company, E. MOPIN AND CO., LTD., is at present engaged in some big building contracts, utilising a patented pre-cast concrete system, in the Leeds district.

The hangars are not of concrete, but of steel, and are circular in plan view, with curved sliding doors. Drawings showed how the "utilisation coefficient", of a circular floor space for aircraft may be higher than that of the orthodox type.

* * *

VALVE-SEAT grinding has been a problem which in the past has been difficult to tackle mechanically. Particularly has this been the case with engines in which the cylinders and heads as made in a unit. One way of tackling this problem was to be seen on the stand of MORRIS AND INGRAM, a firm which specialises in workshop equipment. On this stand it was possible to see a Hall eccentric valve-seat grinder at work inside an aero engine cylinder.

Other interesting tools included cylinder hones, Sioux wet-type valve refacers, bench grinders, sanders and polishers.

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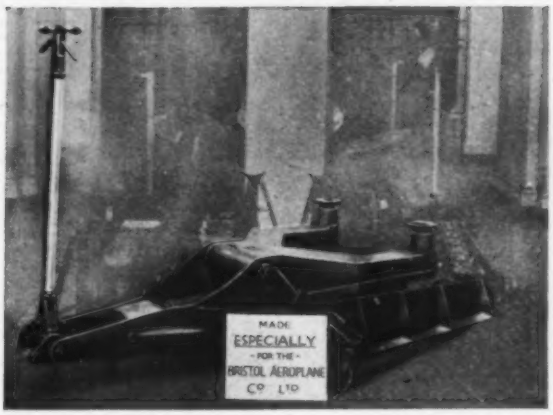
THE display of MOSERS, LTD., concentrated on A.R.P. equipment, complete in every detail down to

AERODROME EQUIPMENT ON SHOW (CONT.)



The five-ton jack on the Epco Stand.

stretchers and surgical boxes, and there is no reason why operations could not be tackled in the light of the paraffin lamp shown. This lamp, it is claimed, can burn for 40 hours on one charge. Quite an attractive side-line on the stand was a powerful Eclipse magnetic chuck. A comprehensive range of small tools, precision tools, including micrometers, verniers, etc., was also shown, together with a number of electrical tools made by leading manufacturers.

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FROM Lt. Cdr. C. B. Sanders, managing director of the NATIONAL FIRE PROTECTION CO., LTD., we heard some worth-while things about fires and the art of putting them out—and also about the misconceptions on the subject cherished by a lot of responsible people who should know better.

He showed us the neat and light (13 lb.) "Essex" automatic installation for aircraft; pictures of the National aerodrome fire tender; a handy-sized methyl-bromide truck for aerodrome use; and an ingenious little affair that should have considerable A.R.P. appeal as a substitute for the official bucket-and-bicycle-pump for hopeful householders.

Actually, this last item is a real piece of fire-extinguishing apparatus, known as the National Airfoam Pump. A 3½-gallon bucket-type water-container has a hand-pump built into its lid. A subsidiary attachment carries a supply of tins of chemical compound. One of these tins is emptied into the water, which is merely rendered saponaceous.

For minor fires the water, in that state, can be pumped, as water, through the short hose provided. But if a more difficult type of fire has to be tackled, a knob is turned, air is introduced and the merely soapy water magically becomes remarkably effective foam.

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AIRCRAFT maintenance engineers must have looked with envy at the display on the stand of NEWTON BROTHERS, for here was the answer to all the delays caused by the finishing of big-end and main bearings. With the "Newton" con-rod boring jig it is possible to finish accurately the big-end bearing to any desired clearance. After the con-rod has been correctly set in the jig the finishing-off of the bearing, regardless of any unevenness in the deposition of the metal, becomes merely a matter of turning a handle, which feeds the cutter mounted on the boring bar into the bearing. The same principle is employed in the Newton boring bar for dealing with main bearings in line.

Another attraction on the stand was the Newton "Masterpiece" connecting rod aligner—a gem of precision tool making.

* * *

THE firm of JOHN B. PILLIN exhibited three types of oil dispensers suitable for aerodrome purposes. The largest was a 58-gallon portable unit, with a cylindrical tank mounted on two pneumatic wheels and two ball-bearing caster wheels. The tank is fitted with a riser pipe carried to a height of 5ft. from the ground. To the top of this pipe is attached 12ft. of 1in. delivery hose, complete with snap-action nozzle and anti-milking valve. Delivery is effected by turning a handle which operates a rotary pump at the base of the riser pipe. The pump is capable of delivering 3 gallons a minute when working against a head of 30ft. above the unit. A 7in. recording meter of the two-hand type records in pints and fractions of a pint.

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IT is not generally known that quite a number of short-wave transmitters have been installed at various civil air stations in this country by the PLESSEY CO., LTD. These transmitters are, in the ordinary course of events, intended for general communication work and are remotely controlled from any convenient point, three pre-set frequencies being provided in the band between 1.5 and 7.5 Mc/s. There are, in fact, only two connections between the remotely controlled panel and the transmitter itself, in which the frequencies are crystal-controlled.

Disregarding any possible developments in cathode ray D/F work, attention is nowadays being paid to the provision of D/F equipment which is easy and rapid in its use. The latest Plessey D/F receiver has a 12in. goniometer dial, with edge lighting, and the interesting feature of this set is that "sense" is obtained without the use of a separate pointer. QDM bearings can be read off instantaneously since there are two bearing rings, one of which can be permanently adjusted to suit the local magnetic variation.

* * *

THE full equipment of an aerodrome includes a large number of meteorological items which are not always considered even by those who are intimately connected with the layout of landing grounds. Apart from such things as barographs, hydrographs and air gauges, the control staff requires means of obtaining really accurate and immediate indications of wind velocity. SHORT AND MASON have recently produced distant-reading versions both of wind-velocity

Aerodrome Equipment on Show (Continued).

and wind-direction indicators. The initial operation of the former is through the usual anenometer, which operates a small generator, the power from which is taken to the indoor indicating dial.

Accurate and undisputed wind-direction indications are essential in the control office. In this case the vane is mounted on the highest point of a control building or on a hangar, while the readings are transmitted electrically to a dial in the office. With the assistance of such an instrument a remotely operated wind tee can be placed in any convenient position (regardless of the wind-flow there) and be turned to show the actual wind direction, and not simply that pertaining at the point where the wind tee happens to be placed.

* * *

AT the stand of SIMPLIFIX COUPLINGS, LTD., on being shown how a Simplifix coupling works, we ejaculated, "Simple enough!" Whereupon Mr. Terrell (managing director) remarked, "Hence the name." Certainly this metal-to-metal, solderless joint (illustrated elsewhere in this review) is the acme of simplicity. It is also efficient, for it will withstand a pressure of 4,000 lb./sq. in.

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IT was difficult to pick on any one particular feature of the display on the stand of TERRELL'S PAINT AND VARNISH CO., LTD. One could only marvel at the superb finish of the panels shown, each one of which was brush-prepared under normal working conditions and not in dustproof rooms.

The company makes all types of finishes for decorative and maintenance purposes. It also handles an unusual type of painter's sponge, made synthetically with a celluloid base.

* * *

THOUGH their products are little larger than motor cars, THOMPSON BROS. (BILSTON), LTD., were another firm who had to be content with showing models and photographs in this intimate little exhibition.

Midway between their biggest power-driven refuelling units and their small trailer units is a new type which should appeal strongly to clubs and for general use on smaller aerodromes. It is a 300-gallon petrol tanker, pumping 20 g.p.m. (against a 20ft. head) of filtered and metered spirit. It is engined with a 6 h.p. air-cooled unit.

Incidentally, it was interesting to realise that, though Thompson Bros. have been building aircraft refuelling tenders for five or six years, they have been specialists for many years before that (and still are) in tanks for the transport of all kinds of liquid by road and rail. Among their products are huge stainless-steel tanks for the bulk carriage of milk.

* * *

QUITE exotic colour schemes were the main feature of the TITANINE display. Chief interest naturally centred round the more bizarre synthetic finishes of which many examples were shown on surfaces which no uninitiated individual would have imagined to be capable of taking a priming coat, let alone a highly glazed finishing coat.

We learnt that a lacquer base is useful in minimising the risk of alkaline reactions being set up when a synthetic paint is employed—it is certainly better than a waterbound base. Incidentally, a mysterious Chinese product, known as tung oil, is one of the chief constituents in many synthetic paints.

On the Titanine stand there were also examples of camouflage paints and also an aluminium finish for corrugated sheets which is designed to impart the maximum possible amount of light value.

* * *

AFTER a considerable period of experiment and studying of requirements, SILENT GLIDING DOORS, LTD. (who have a long-established reputation as sliding-door makers among the building trade), are now about to go into production with their "Aerodoor" for hangars, and a small example was being demonstrated at the Exhibition.

The design is simple and, like most simple things, effective. The door consists of any required number of cold-rolled-steel hollow mullions—in effect, elongated steel boxes, standing vertically—hinged one to the next at top and bottom or, in the larger sizes, intermediately as well. At the bottom of each mullion is a vee-grooved wheel on a floor rail, while a graphite-lubricated spigot sliding in a channel forms the top guide. A flange down one side of each mullion to overlap the next provides a draught-proof joint.

As it opens, the door is guided "round the corner" by sprockets on a vertical shaft, and slides in flush with one of the inner walls of the hangar. Actuation is by a steel cable attached to each end of the door, led over pulleys, and drum-operated by an electric motor on the endless rope principle.

The company's technical director, Capt. E. E. Rouse, late of the Royal Engineers, is an inveterate inventor, so various ingenious manifestations of the new door may be prophesied.

* * *

ALTHOUGH not necessarily designed solely for aircraft work, STANDARD TELEPHONES' omni-directional radio beacon is an important development if only because the crowded wavebands are encouraging aircraft crews to be, so far as possible, independent of normal ground D/F stations. With these automatic beacons in known positions, any operator can plot a fix for himself. Three such beacons have already been installed, at Mitcham, Schiphol and Le Bourget. The Standard beacon works on a frequency range of 350-240 kc/s, and the intervals between the coded signals are controlled by a chronometer. At the same time, the station can, when necessary, be used as a straightforward R/T—W/T transmitter.

One of the most recently introduced items of Standard radio equipment is a new type of general-purpose radio receiver which can be obtained in either long-wave or short-wave form. One of the important features of this set is its accessibility. The pre-selector part of the set is entirely separate from the receiver proper, and either can be removed, with its chassis, from the outer case without the necessity for any disconnecting. Although not on view at the Central Hall, Standards also hold the sales and manufacturing rights for Lorenz blind-approach transmitters and receivers.

* * *

WHILE it is difficult to visualise aircraft being passed out with patched tyres it is not difficult to realise the efficiency of modern vulcanising methods as demonstrated on the stand of L. STEINER. Rubber boots, conveyor belts, hose and even diving suits (memo for "A. Viator's" Works and Bricks at Croydon) can be patched with the aid of the Stenorizer. This machine, briefly, is an electrically heated clamp which automatically switches itself off as soon as the correct temperature has been arrived at. A simple sand glass (cooking variety) is set in action—or on the more expensive models, a miniature alarm clock is started—to ensure that the patch is cooked for the correct length of time after the heat has been turned off.

* * *

A PRACTICAL method of putting used oil on the credit side of the ledger was being demonstrated by the STREAM-LINE FILTER CO., LTD. Mr. W. Newland Williams, of their technical research staff, explained to us that a good lubricating oil loses none of its efficiency by being used over again—in fact, it may actually be improved; and he showed us the authority of a leading oil company for that statement. All that is required is that oxides, metal and silica in suspension and all the other undesirabilities collected during the passage of the oil through the engine shall be utterly removed.

This the Stream-Line filter does, and undoubtedly does it properly—so much so that the Air Ministry approves the process for aero engine oils.

Small and inexpensive plants—from £10—now bring this economical process within reach of the smaller operator, e.g., flying clubs with three or four machines.

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AGROSTIS Alba, Festuca Longifolia, Festuca Rubra var. Fallax, Poa Pratensis, Cynosurus Cristatus, Lolium Perenne . . . Not a Latin incantation—just a few of the varieties of grass which SUTTON AND SONS, LTD., regularly use for seeding aerodromes, often in combinations of several types. Specimens on the stand showed the varieties used for De Havilland's White Waltham Reserve School and other aerodromes, and an array of test-tubes, specimen glasses, charts and what-not impressed the visitor with the fact that laying a durable green carpet on an aerodrome is not just a matter of broadcasting grass seed.

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THE TECALEMIT people half seriously remarked that if they brought along all their factory's range of products they could fill the whole show.

Judging by the variety of things which they make for the aircraft industry alone, the remark is no exaggeration.

Among the items which were demonstrated for us by Group Capt. E. F. Briggs, D.S.O. (a director) and Mr. J. K. Beckett (meter and fuel handling manager) were the Series II refuelling nozzle, which cuts off the flow from the supply pipe when the fuel in the tank reaches a predetermined level on the nozzle; an aircraft grease-gun—a hand type—giving the almost incredible pressure of 5,000 lb./sq. in.; an improved "Aerodrain" for emptying aero engine sumps; and an air and water eliminator for bulk fuel supplies.

Studying the last, we were prompted to remark that we could see the objection to water in a fuel supply—but why worry about air? The answer, we were told, is that you cannot meter fuel accurately if it contains air.

We were also reminded that petrol varies in volume by 0.11 per cent. for every degree Centigrade rise or fall in temperature. This statement becomes far more startling when one is told that 1,000 gallons in a bulk supply become 978 gallons if the temperature falls by 20 deg. C.

The Tecalemit experts were demonstrating the fact visually with an ingenious apparatus using two of their accurate liquid-measuring Tecalemeters.

SPITFIRES for the SQUADRONS

Pushing them out : A view through the hangar doors at Eastleigh. Nearest the camera are (left) Mr. A. H. Nelson, Supermarine's assistant works manager, and (right) F/O. J. K. Quill, test pilot.

Reassuring Flow of Production Machines : Testing Our Fastest Eight-gun Fighters : Exceptional Flying Qualities

(Illustrated with "Flight" photographs)

SO far as is known, the Supermarine Spitfire is the fastest fighting aircraft on issue to any air force in the world, having a top speed of something over 350 m.p.h. Certainly it carries a heavier armament load than does any foreign counterpart (eight machine guns mounted in the wings), and its handling qualities, despite its superlative performance, are something to marvel at.

The structure of the Spitfire has already been described in some detail in *Flight*; it may be recalled that the beautifully shaped wings, with their slightly inverted gull roots, are single-spar, and that the fuselage, like the wing, is of stressed-skin construction. The machines in the first batches delivered are fitted with two-bladed fixed-pitch wooden airscrews for their Rolls-Royce Merlin II engines (1,030 max. h.p. at 16,250ft.), though variable-pitch De Havillands are being provided for subsequent machines, with the constant-speed Rotol as an eventual alternative.

Production Spitfires are assembled in two hangars at Eastleigh, and are sent out on to the tarmac at a creditable rate, though peak production has not yet been attained.

The first flight of the prototype was made by Flt. Lt. M. Summers (in charge of testing at Vickers' Weybridge works), but the great majority of subsequent test work on experimental and production Spitfires has been done by F/O. J. K. Quill, A.F.C., with P/O. J. H. T. Pickering, A.F.C., lending a hand when he is not engaged in flying Stranraers and other marine types for the Supermarine works at Woolston. F/O. Quill took a short-service commission in the R.A.F. in 1921. After a spell at the F.T.S. at Grantham he joined No. 17 (Fighter) Squadron at Upavon, where he flew Bulldogs. Two years were spent with the "Met." Flight at Duxford on Siskins. Having extended his short-service commission for three years he was posted to Martlesham, but in the meantime he was offered the job of testing Vickers machines at Wey-

Distinguished : The first Spitfire with a De Havilland two-position v.p. airscrew ; they will shortly be standardised.

The power and the pilot : F/O. Quill about to pronounce judgment on another Spitfire.

bridge. Here he flew the Perseus- and Pegasus-engined Vildebeest, Venom, Vickers-built Hart and Wellesley types. He left Weybridge for Eastleigh last May.

Over a cigarette between flights we recalled with F/O. Quill the days when test pilots mooned around the aerodrome weighing up their chances of having an aeroplane to test during the week Recently, Quill flew nine different Spitfires in one day, which meant going into the air thirteen or fourteen times. This figure, of course, must not be taken as an indication of the output of Spitfires. Often machines pile up (though not in the colloquial sense) for one reason or another and have to be despatched to the Service as quickly as possible after a final testing.

F/O. Quill gave us an outline of the test programme to which every production Spitfire is subjected after it is trundled out of the hangar.

Diving

Two days or so before the first flight the Merlin is run up and any necessary adjustments made. The Spitfire is then wheeled round in front of the pilot's office, which faces the tarmac, and is taken off. During the first ten minutes Quill determines whether or not any rigging adjustments or other minor changes are desirable. Should everything be found in order he stays in the air for about forty minutes, taking figures on a climb to 17,000 or 18,000ft. Then he does a comparatively shallow dive to about 400 m.p.h. "on the clock" (this reading, at about 12,000ft., is actually equivalent to about 500 m.p.h.), limiting engine revs to 3,600, the relationship of revs to the speed of the aircraft, of course, being influenced by altitude. The functioning of the engine-driven generator, compressor, etc., and of the sliding cockpit roof (which, incidentally, is slightly convex in the newer Spitfires) is then tested. This is followed with a prolonged glide with the radiator outlet shut or wide open to test the thermo-

(Below) A telling glimpse in one of the assembly shops, with a row of Spitfires in the background, and waiting Merlin II engines in the foreground.

static valve, designed to prevent cooling below 75 deg. C. Each production Spitfire makes at least three landings and take-offs. Apart from these, if there is any sign of a sticky oleo, the pilot taxies on a rough part of the aerodrome or deliberately drops the machine during a landing. Any time remaining out of the allotted forty minutes is killed most enjoyably for the pilot (and for denizens of the tarmac and roadside) with aerobatics. One gathered that the Spitfire's controls are happiest for rolls, etc., at speeds in the neighbourhood of 200 m.p.h.

Handing-over

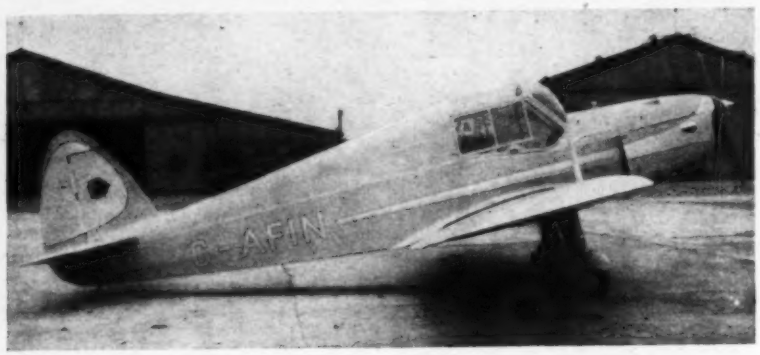
F/O. Quill, actually, is one of the finest demonstration pilots in the country. His handling of the stubby little Vickers Venom monoplane fighter during the S.B.A.C. display at Hatfield in 1936 will not readily be forgotten; nor will his performance on a Spitfire at last year's Brooklands Garden Party. Having done a good deal of test flying on the Wellesley, he also has a distinctive way with that substantial bomber.

The actual handing over of a Spitfire to the Service is superintended by Mr. A. H. Mitchell, the chief A.I.D. inspector, who requires each Service pilot to present a letter from his C.O., stating that the bearer is in uniform. The pilot is then handed a form (No. 1090), authorising the machine to be delivered to His Majesty's Service, together with an inventory of its equipment.

H. F. K.

Some further impressions captured by *Flight's* photographer at Eastleigh. In the centre picture a Spitfire is seen on the revolving compass base. The lower view shows Mr. A. H. Mitchell, chief A.I.D. inspector, handing over a Spitfire—with its "credentials"—to a Service pilot who has come to collect it for his Squadron.

CORRESPONDENCE



The Chrislea monoplane in its finished and spatted form. This two-seater lightweight has a maximum speed of 118 m.p.h., a cruising speed of 105 m.p.h. and a range of 350 miles. The permissible disposable load of the Chrislea, which has a Walter Mikron engine, is 488 lb.

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

BUFFETED BY FATE

Or, is Half a Sandwich Better Than No Coffee?

AN Australian friend of mine was anxious to see the greatest airport of the world's greatest city. After several hours of standing on the roof and listening to aircraft buzzing overhead in the fog, emerging from time to time and landing, we thought it was time for lunch. Entering the palatial buffet, the following conversation took place:

Myself: "Coffee for two, please."

Smiling damsel: "Sorry, we have no coffee."

Myself: "Ham or beef sandwiches, please."

Smiling damsel: "Sorry, we have only half a sandwich."

My Australian friend said nothing, I thought a lot. Finally we had tea and Dundee cake. Truth *is* stranger than fiction.

London, W.9. W. L. NAYLOR

ROLLING A MOTH

Two G.E.s Reply

AS the two engineers referred to as "nearly having apoplexy" by "C.A.G. 811" (*Flight*, January 5), may we put forward our defence?

Another correspondent, Mr. Symondson, claims that his Moth (ten years old) has performed many flick rolls in its 500-odd hours' flying. May we point out that the Moths with which we are concerned have at least 3,000 hours in their log-books, most of which has been done by pupils in the early stages of learning to fly?

This is not quite the same thing as 500 hours carried out by an expert pilot—as presumably, Mr. Symondson would be classed.

Most of the correspondents who have written to you on this subject seem to have missed or ignored the chief point of our argument. We admit that a flick roll, or any aerobatics carried out expertly, impose little or no undue strain on the machine. But we still maintain that these same manœuvres carried out by comparative novices are *not a good thing*.

In conclusion, may we point out to another correspondent, Sgt. Pilot McKay, that, owing to an aerobatic oil tray which is fitted to Gipsy engines, it is impossible for oil to flood the cylinders while in an upside-down position?

Richmond and Hounslow. TWO G.E. PILOTS.

ASSISTED TAKE-OFF

Letting Gravity Take a Hand

I NOTICED in *Flight* of January 12 that you dealt at considerable length with the problem of launching trans-atlantic air liners and that various experiments were being tried to enable an aircraft to take-off with enough fuel on board to enable it to cross the Atlantic carrying a payload as well. Perhaps I can make a small contribution to the solving of the problem.

A number of years ago I spent many weeks exploring our northern hills with my Zephyr sailplane and in this wild country one of the great difficulties was to find launching crews; sometimes only one man was available, and sometimes two.

If one man were available the method was to find a fairly steep grass slope, place the machine at the top of it so that it could be rocked over on to the slope, and then, with the one assistant steadying the wing-tip slide down the slope until flying speed was reached and the machine either took off or was eased off with the elevator.

I feel sure that if suitable hills could be found on both sides of the Atlantic a development of this method of launching would prove possible, that is to say, run the machine downhill with the engines all at full throttle until the machine reached flying speed when it would take-off; or, alternatively, run it downhill and over a bump or drop so that it could take-off like a ski runner and then gain its final flying speed in the air.

If the method became popular properly prepared runways leading down in various directions from the flat top of a hill would follow in due course. A hill with a large flat top is necessary because landing would have to be made there in the first instance.

If the slide-rule brigade will now get busy and work out the slopes and landing areas required and let me know I might be able to give some indication of where to look for a suitable place. ERIK I. W. ADDYMAN.

Starbeck, Harrogate.

MOBILE INSTRUCTORS?

Some Training Suggestions

FOR a few weeks prior to the formation of the Civil Air Guard I was nursing a letter to the Air Ministry proposing that "B"-licensed pilots should be allowed to give elementary instruction to would-be aviators from fields in various places that had been previously licensed for joy-riding; thus an instructor could meet about a dozen pupils near their own town on a certain day at an appointed hour, daily proceeding from town to town.

There is a regulation that no instruction shall be given from a field only licensed for joy-riding, but any pupil, after five hours, would be keen enough to proceed to the nearest aerodrome, however far, and finish his landings and hours for "A" licence; consequently the instruction at licensed fields would be only similar to joy-riding.

Although the C.A.G. has now come along I feel that something on these lines can still be done, and would help pupils a great deal; I have many times seen them hang around a club-house all day for weather, and go home very disappointed after having come as far as 40 miles. I have also seen fair flying weather after midday wasted just because it was bad in the morning and pupils 'phoning were put off, so no one turned up. A mobile instructor could do a lot to increase his instructional hours.

Probably, when the number of instructional craft and "B"-licensed pilots increases to equal C.A.G. requirements the Air Ministry will allow such facilities from licensed fields, as there are a great many keen men far removed from aerodromes who would pay the old rates if necessary in order to become pilots.

Now I see that consideration is being given to the prospect of providing the more experienced club pilots with C.A.G. facilities of an advanced nature, as these are the men who will be of real and immediate service to the country in the event of emergency; but here, again, extra instructors are wanted, also more and more dual aircraft, which at present appear to be at a premium.

This is where the poor private owner should be encouraged, as no pilot gains so much worth-while experience as the P.P.O.; he becomes keen to master everything, having the responsibility of his aircraft; he becomes an experienced cross-country man, an adept at strange fields and forced landings, and does more to show the public how nice and safe is flying than does the club pupil, who learns very little about the aircraft itself.

Could not some private owner, someone in authority, put

a word in to the Air Ministry for a subsidy for his fellow-men? As a form of subsidy which would treat everyone alike and fairly, I am going to suggest free petrol and oil; its price is half tax, anyway, and could easily be recorded and accounted for. Such subsidy would not cost the Government a lot, but would be greatly appreciated and helpful to private owners, present or to be, and stimulate a market for single-, two-, and three-seater aircraft at nowhere near the subsidy expenses proposed for C.A.G. extended facilities. ERIC WARD.

Liverpool Airport.

[*A few months ago our contributor "Indicator" discussed at some length the desirability of encouraging the private owner.*—ED.]

NOCTURNAL WIND-TUNNELING

Depressing?

READING your journal of January 12, I see that Mr. R. K. Pierson suggested a night-shift to use the 24ft. wind tunnel at the R.A.E. to its full capacity. One sometimes wonders whether the promoters of these ideas are aware of what they mean to the actual victims. From personal experience I found night work depressing both physically and psychologically.

The chief effects are a marked loss of vitality and a strange sticky, "unfresh" feeling (even after a sound sleep) and a considerable loss of appetite. This all strikes one more forcibly at first and after one or two weeks one tends to persuade oneself that one has "got used to it now." A fresh spell of day work will soon shatter that impression: one's appetite rises nearly 100 per cent., the complexion regains its lost colour, and health is born anew.

There are other troubles, too, from the domestic and social points of view, but the chief evils of night work are the physical and psychological effects. Whatever be the rate of pay this existence will *never* profit a man in the long run; the human machine is just not designed for it.

There are, of course, a few deserving cases, such as that of law and order, and, above all, the night work done in hospitals by nurses (horribly underpaid, I believe), but aerodynamic research, even on a 24ft. wind tunnel, is certainly not one of them.

In conclusion I wish to state that I have no ties, social, professional, or otherwise, with anybody at the R.A.E.

Southamptom, Hants. L. TIFFREAU.

No. 90 (B) SQUADRON

Its Early History

I READ with interest Major F. A. de V. Robertson's article in *Flight* (January 19) on No. 90 (B) Squadron.

The earlier history of 90 Squadron is unusual.

In May, 1918, No. 38 Squadron, with three detached flights stationed at Leadenham ("A" Flight), Buckminster ("B" Flight), and Stamford—now Wittering ("C" Flight), was ordered overseas at very short notice, equipped with F.E.2B aircraft.

These units were re-equipped with more F.E.2Bs and renamed No. 90 (Home Defence) Squadron.

During the summer of 1918 their equipment was changed to 110 Le Rhone Avros, and the armament consisted of one Lewis gun firing over the top plane.

The Squadron was in existence for at least twelve months and, on returning from France, I was a member until it was disbanded.

I agree with Major Robertson that any lack of war records has no bearing on the spirit of the present 90 Squadron, but my personal associations with the Squadron—both past and present—are very dear to me, and it is somewhat disconcerting to read in your usually extremely accurate paper that the Squadron *never existed*! L. A. W. DEANE,

Stoke Mandeville, Aylesbury. Flight Lieut., R.A.F.O.

[*Our correspondent rather overstates the case. Maj. Robertson did not say that the Squadron "never existed"—merely that, in view of the earlier unit's somewhat brief and disorganised career, it is "preferable to regard No. 90 B.S. as a new formation in March, 1937."*—ED.]

THE AIR MINISTER GOES SOUTH

Sir Kingsley Wood Sees Production at Southampton and Portsmouth

SIR KINGSLEY WOOD, Secretary of State for Air, made yet another tour of aircraft factories when, on January 30, he flew to Portsmouth and Southampton.

He made the journey in the Air Council's D.H.86b, piloted by Wing Cdr. H. K. Goode, and was accompanied by Sir Edward Campbell, M.P. (his Parliamentary Private Secretary), Air Marshal Sir Wilfrid Freeman (Air Member for Development and Production) and Sir Charles Bruce-Gardner (Chairman of the Society of British Aircraft Constructors).

At Portsmouth Sir Kingsley spent just over an hour at the works of Airspeed (1934), Ltd., and saw the production of Airspeed Oxfords, which are being turned out in considerable quantities.

The Air Minister, at Southampton, saw two phases of the manufacture of the Supermarine Spitfire; the construction of the fuselage and wings at Woolston and the assembly of the fighters at Southampton Airport.

Arriving at Southampton Airport, Sir Kingsley was met by Mr. A. Dunbar, managing director of the aviation interests of Vickers-Armstrongs, and Mr. H. B. Pratt, general manager of the Supermarine Works.

The Air Minister and his colleagues were taken to Woolston by road. Here he saw a Supermarine Walrus take off from the company's Itchen runway and give a flying display which included some almost vertical turns. Then he was taken into the factory to see the construction of Spitfires, Walruses and other machines. Sir Kingsley asked numerous questions and shook hands with a number of mechanics.

Returning to Southampton Airport, Sir Kingsley spent a hectic hour. He was first shown over the remarkably clean and tidy Supermarine hangars, where he saw numerous Spitfires in various stages of completion. [An article on flight testing of Spitfires appears in this issue.—ED.]

In one corner he saw the highly polished, blue-painted Spitfire which is still enveloped in an air of mystery.

A display of aerobatics was given in two Spitfires by Flt. Lt. G. Pickering and F/O. J. K. Quill, and the Air Minister afterwards sat in one of the machines.

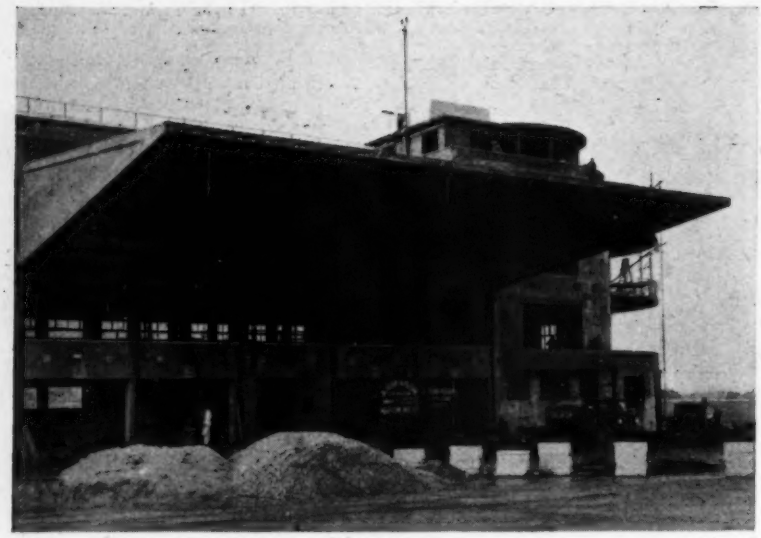
Sir Kingsley visited the old and new factories of the Cunliffe-Owen Aircraft Co., and was taken inside the cabin of the prototype "Flying Wing" by Mr. Hoyes, managing director of the company.

Enterprising aircraft manufacturers at Southampton Airport also gave unofficial demonstrations of the Wicko high-wing monoplane and the Kay Gyroplane.

From Southampton, Sir Kingsley flew to the aerodrome of Air Service Training, Ltd., at Hamble, and paid a surprise visit to the works of the Folland Aircraft Co., where he was shown round by Mr. H. P. Folland and Mr. R. W. Richards.

In an interview, the Air Minister paid high tribute to both Airspeed (1934), Ltd., and the Supermarine branch of Vickers-Armstrong, and said they were both playing an important part in national aircraft production. He also commented on the speed with which the Cunliffe-Owen Aircraft Co. had erected their new £150,000 factory.

HENSHAW TRIUMPHANT: Alex Henshaw before the start of his Cape record attempt last week-end. Flying his little King's-Cup-winning Percival Mew Gull (Gipsy Six R) he did Gravesend—Cape Town in 39½ hours, against F/O. Clouston's 45 hours. He is due to return as we go to press, and next week we hope to deal fully with his achievement.



PAPERS at the

Mr. F. Greenwood on Modern Airport

Mr. H. J. Andrews on Qualif

On the left is the terminal building at Elmdon (Birmingham), described by Mr. Greenwood. Shelter canopies on each side are striking features of the design. On the right is the frontage of the new terminal building and hangar at Speke (Liverpool), which is managed by Mr. H. J. Andrews.

MR. F. GREENWOOD'S PAPER

AS the latest and largest of the provincial aerodromes, Birmingham's airport at Elmdon is of special interest. Furthermore, as Mr. F. Greenwood, of the Birmingham Town Planning Department, explained in the paper which he read before the A.O.A. last week, every effort had been made at Elmdon to establish an aerodrome which would later fulfil the most stringent requirements. Generally speaking, his paper consisted of a description of the layout and construction of Elmdon, but, since the conditions and requirements of all aerodromes are basically similar, Mr. Greenwood's comments should be of considerable value.

After explaining the importance of making a careful study of Air Ministry demands so that the ultimate cost of any scheme could be visualised, Mr. Greenwood suggested that many local authorities could reasonably and economically get together and produce a joint scheme—one good aerodrome serving two or three authorities.

So far as the Birmingham scheme is concerned he said that the airport authorities had always been in close touch with the Air Ministry and with their own consultants, so that there should be no hitch later in the development which might necessitate expensive modifications to the original plans. After briefly referring to the essential physical requirements of an aerodrome's surface, gradients, size and freedom from obstructions, he said that the site chosen by Birmingham, though not absolutely ideal, was the best possible compromise. It was actually about seven miles from the city centre and was, even now, reasonably accessible by road or rail.

The history of Elmdon started in 1933 when the Council authorised the compulsory acquisition of 300 acres of land. A year later another 214 acres was similarly acquired. In June, 1935, the Council approved the promotion of a Bill in Parliament to provide for the acquisition of further land, for the diversion of roads and footpaths, for the imposition of development restrictions in the area, and for the removal of obstructions. By that time 730 acres had been acquired. As previously explained in *Flight*, the scheme is to be carried out in two stages, the initial development being confined to the western area and providing runways varying from 1,100 to 1,200 yards in length. The final scheme provides for the enlargement of the landing area from 216 acres to 243 acres and the provision of runways up to a length of 1,500 yards.

As a result of observations taken over ten years it was found that south-west winds were most frequent, though there was a fairly high percentage of west, north-west and south winds. Easterly and north-easterly winds occurred more frequently during spring and early summer, and gales occurred on an average of six days in the year. Meteorological investigations showed that Elmdon would suffer less from low cloud than Croydon, but that the frequency of visibility below 220yd. was likely to be a little greater.

Mr. Greenwood described in detail the work involved in the preparation of the site, and particularly in the work of drainage and of the methods used to make the aerodrome and its markings comply with Air Ministry requirements. In addition to the normal markings, a fog line, 12in. in width, had been laid down in concrete in lengths of 42ft., with gaps of 8ft. No artificial runways were to be constructed as it was not difficult in this country to provide a satisfactory grass surface. Nevertheless, he agreed that runways had considerable advantages and noted that, years ago, when the *Bremen* made its Atlantic flight it was taken off from the concrete runway at Dessau after a run of only 1,800ft., whereas, with a decreased load, a 4,750ft. run was required for the take-off from the rough cinder runway at Baldonnell. If machines increased in weight it might be necessary to lay out artificial runways, but the cost of these was somewhat prohibitive. It was possible that more accurate approach guidance might, in the future, permit these to be narrower, and consequently less expensive.

The terminal building at Elmdon was a four-storey one, and was particularly interesting in its form of construction. It made provision for covered loading by the use of balanced cantilever canopies, around which the building was very largely designed. Each of these canopies permitted the cabin of any normal machine to be under cover.

It was anticipated that radio equipment would be installed when traffic conditions warranted it, and a site for the outer marker beacon had already been reserved. On the other hand it had been decided that full lighting facilities should be offered at once, these to include three floodlights. Mr. Greenwood went on to describe the different items of lighting equipment, including the provision of a separate generator set which would supply all the essential power if and when the main supply failed. A system of contact lighting had been considered, but as no assistance had been forthcoming from the Air Ministry the idea had been turned down on the score of cost. It was estimated that a single line of light would cost approximately £3,200, while £8,400 would be spent if all the runways were so illuminated.

Zoning

Even when the airport was first being considered it was realised that some form of zoning was required to control the height of buildings in the vicinity. At the time the possibility of providing such control by the draft Town Planning Scheme under the Town Planning Act of 1932 was difficult, and it was recommended that the necessary powers should be included in a Parliamentary Bill. This was passed in 1936. The zoning at Elmdon does not extend to the distances recommended by the Air Ministry, but was amply sufficient for the purpose. The restrictions do not, in fact, prevent normal building, since dwelling houses up to 30ft. high could be erected in practically the whole of the protected area.

Towards the end of his paper Mr. Greenwood gave some illuminating cost figures for Elmdon. For the purchase of ground, for instance, £130,163 had been paid; the site preparation cost £28,314; the cost of the buildings, entrance roads and general equipment totalled £144,647; while the lighting equipment cost £18,861. It was estimated that the work still to be done, including the removal of a large number of trees and the purchase of certain additional land, would cost £39,181. Altogether, the whole scheme, as at present visualised, would cost £361,816.

After dealing briefly with certain maintenance problems,

at the CONFERENCE

Modern Airport Constructional Requirements and Views on Qualifications for Aerodrome Management

Mr. Greenwood gave three essential and obvious reasons why the development of air transport lines in this country has been slow, and explained that until plans, information, or financial assistance were available from the Government, local authorities were deterred from undertaking schemes which might later be considered to be redundant. He found it difficult to understand why the Government should, quite rightly, subsidise airline traffic, but at the same time refuse assistance for the provision of the essential ground organisation.

THE DISCUSSION

IN his opening contribution to the discussion, Mr. R. Brown, of South Africa, explained some of the difficulties experienced by airport owners and operators in that country. The problem there was to find something on which to grow grass and, of course, the very considerable differences in height at various points made it impossible to standardise runway lengths and zoning area sizes.

Councillor A. Goldman, representing Hastings, surveyed the somewhat depressing history of the local aerodrome, and gave an idea of the difficulties faced by similar boroughs. For instance, to increase the size of the Hastings aerodrome to that at present recommended would mean an addition of 6d. on the rates. He suggested that the Air Ministry might assist by some form of unemployment relief work on aerodrome sites.

Two speakers—from Wolverhampton and Coventry—had obviously taken slight umbrage at Mr. Greenwood's remarks about the advisability of co-operation between smaller towns in close proximity to one another. The former spoke of the difficulties of surface communications in such a case, and asked where the Government would have been if municipalities had not provided aerodromes, while the latter explained how very important local aircraft factory development could be.

Councillor J. U. Primrose, answering Mr. Greenwood's doubts about the value of the grass-drying scheme, said that at Perth 600 tons of grass had been obtained from 240 acres.

One of Newport's representatives suggested that the Air Ministry was doing its best to make the municipalities provide the biggest possible aerodromes, and he asked that the race in size should be stopped. It should not be left to the local authorities to make their own arrangements; the Government should put forward a special Act to cover the whole matter of aerodrome size and layout.

Although take-off distance was reduced by as much as 30 or 40 per cent. by the use of concrete runways, Mr. Gandar Dower said that his company's experience on the Newcastle-Stavanger service had proved that such runways were very hard on tyres and undercarriages. He, also, demanded finality in airport size requirements, and said that it was the very districts which could not afford aerodromes that appreciated and needed air transport more than any other. He was speaking, of course, of the Orkneys, Shetlands and the Hebrides.

After Mr. J. Alexander, of Belfast, had described some of the peculiar points of airport development by harbour authorities, Air Commodore Robertson, in charge of Croydon, said that airport owners could only learn from each other's experience. Croydon was the first big international airport, and they were now paying for their own initial mistakes. He demanded full co-operation in future between the aircraft designer, the airline operator and the airport owner, so that a limit could be applied to aerodrome size. A great deal of money, he found, was spent in small alterations after an aerodrome had been opened, and he thought that most people underestimated the amount of office accommodation required by airline companies. Speaking of indirect assets, he said that the amount of the Customs duties at Croydon would probably be sufficient to pay for that aerodrome's upkeep. He suggested that the public ought to be more seriously considered and catered for.

MR. H. J. ANDREWS ON RUNNING AN AIRPORT

IN the introduction to the paper which he read before the Aerodrome Owners' Association, Mr. H. J. Andrews, who is the manager at Speke, explained that the conditions at different aerodromes were very varied and that it was, therefore, impossible to lay down definite rules to be followed by the aerodrome manager. He did, however, give a number of very useful pointers in the light of his own experience.

In the first place he defined the primary duty of a manager as that of administrating his aerodrome in such a manner that it would pay its way, directly or indirectly, as soon as possible. In other words, his basic qualification was of business ability. In assessing revenue it was easy enough to deal with direct sources, but not so easy to arrive at an accurate estimate of the total revenue. For instance, a well-developed municipal aerodrome which became popular with visitors might cause an appreciable increase in the number of passengers carried by the local transport organisations, while the presence of a factory would cause the authorities to benefit from such sources as rents and the result of local money circulation. Such indirect revenue was impossible to assess, but it should not be forgotten by municipalities when they were considering the layout of an aerodrome as a financially self-supporting venture.

From the very start the manager of an aerodrome should attempt to formulate the basis on which his aerodrome might eventually pay its way. Taking a hypothetical example, Mr. Andrews considered an airport on which a sum of £750,000 had been spent. He assumed a maximum traffic capacity of 240 machines a day—one movement every three minutes. With this turnover an average net profit of 5s. 2d. per machine was required to pay 3 per cent. on the capital outlay. If the maintenance of the aerodrome cost 2 per cent. on this outlay and the staff salaries amounted to £8,200 a year, an additional sum of £23,000 per annum had to be obtained somehow, and this involved a further average charge of 5s. 4d. for every machine. Thus, when fully developed, an aerodrome had to obtain an average sum of 10s. 6d. for every machine handled. Such an estimation, made at the very start of an aerodrome's life, provided a guide to the limit of reasonable capital expenditure.

Now that the Air Ministry was taking over air traffic control, together with communications, radio and meteoro-

logical services, a manager's knowledge of such matters need not be quite so intensive. Nevertheless, such knowledge would always be indispensible for efficient co-operation between the different departments. In any case, the management still retained responsibility for the handling of aircraft on the ground; for the maintenance of the lighting equipment and internal intercommunication arrangements; and for the maintenance of an air traffic register. On the management depended the efficient service of landing parties and the training and equipping of units for dealing with emergencies. Mr. Andrews stressed the importance of a good understanding and harmonious working between the control organisation and the operators. This understanding devolved upon the manager, from whom was demanded that sound business attribute—tact.

So far as technical qualifications were concerned the manager should have the ability to read and prepare architects' and engineers' drawings; he should have an elementary knowledge of land survey; a sound knowledge of land drainage maintenance, of the operation and maintenance of every item of aerodrome equipment; experience of building maintenance; and a general knowledge of aerodrome surface requirements. In connection with the last he mentioned that, on a large area, grass cutting and maintenance might be most efficient and economically carried out if the cut grass were converted into furnace-dried grass, which was a saleable commodity.

It was generally considered that the manager of an aerodrome should have had ample flying experience, preferably as a pilot, and a knowledge of advanced air navigation was a valuable asset. Additionally, at those aerodromes where commercial flying was to be fostered, it was desirable that the manager should possess or acquire experience of air transport operation. Other particular qualifications were demanded in special cases.

Earlier in his paper Mr. Andrews stressed the importance of business ability. In detail, this ability included experience of practical office administration; a sound knowledge of legal obligations and air regulations, including legal liabilities; an experience of insurance matters; and the ability to look after and train the working staff of the airport. It was important that the management should develop an organisation whereby all regulations, notices and relevant information could be readily available to all concerned. An office might be put on one side for this purpose, and the scope of the information available would be further increased by the provision of daily weather reports and so forth. Where an aerodrome possessed such facilities it was necessary for the manager to have a thorough knowledge of Customs regulations.

Obviously, every effort should be made to increase the direct and indirect business at an aerodrome. Not only must the manager establish the best possible understanding with his clients, but he should also do his best to see that the general public in the district was duly encouraged to take an interest in aviation as a whole.

Another little point mentioned by Mr. Andrews was that of maintaining a careful record of transport enquiries. The statistical maintenance and such records would help the airline operators in readjusting their time-tables and in considering new routes. For example, an analysis of the enquiries at Speke showed that between May and August last year a direct service between that point and Dublin, leaving at about 8 a.m. and returning at about 7 p.m., could have counted on an average of about three passengers per trip.

Mr. Andrews concluded his paper by impressing again the importance of discretion and tact.

THE DISCUSSION

IN spite of Mr. Andrews' suggestion earlier in his paper that the discussion on the subject of airport management was likely to prove more informative than the paper itself, very little of direct importance and interest was said afterwards. The delegates' remarks tended to wander off on to other matters and to suffer from the usual tendency towards inter-tribal jealousy.

One of the most useful contributions was from Mr. R. Brown, representing the municipal airports of South Africa. He asked why there were no examinations for airport managers, and suggested that this important post should hold its appropriate Air Ministry licence. He explained that in South Africa the managers had to pass such examinations.

Referring to the ever-recurring grass-drying question, Mr. R. E. Ford, of Doncaster, explained that the Land Fertility Committee had agreed to contribute 50 per cent. of the cost of lime and 25 per cent. of the cost of the basic slag used at Doncaster aerodrome to fertilise such grass as was good for drying purposes.

Mr. W. F. Davison, of Merseyside Air Park, complained of the disgraceful salaries which were paid to airport managers, and suggested that these were similar to those paid to the "average town clerk's assistant's junior clerk."

At smaller aerodromes it was convenient and economical for the management to be in charge of the local club's flying instructor. Mr. H. W. Stanton, of West Hartlepool, said that in their own particular case there was some question of whether the chief instructor of the local club or the chief instructor of the Reserve School should have the position. In his reply, Mr. Andrews mentioned one difficulty of combined duties, which was that when vigorous action was required in an emergency, such as after a crash, the manager might be in the air.

Dealing with indirect revenue, Mr. J. U. Primrose, the new chairman of the Association, remarked that something like £50,000, representing the salaries and wages of the staff at Perth airport, was spent in the town.

DINING THE DELEGATES

ALTHOUGH this may only have been the effect of a good dinner, it appeared, judging from the various speeches at this year's Aerodrome Owners' Association dinner at Grosvenor House, that the owners are feeling just a little happier about things than they were last year. Possibly the Association's quarterly meetings with the Air Ministry, which were held in March and October, helped to make the delegates feel that their difficulties were at least understood, if not met.

Nevertheless, Capt. Harold Balfour, the Under-Secretary of State for Air, who proposed the toast of the Association, made it quite clear in his speech that the Air Ministry's idea is still, and probably rightly, that both airlines and airports must eventually be economically self-supporting. He did not say so in so many words, but that was the general impression which he conveyed. He explained that at present the Royal Air Force must have priority, but this was the time for stock-taking in order to prepare for the future.

In his reply, Lord Londonderry, the President of the Association, said that the aerodrome owners' position was now a little more hopeful, particularly since they were now coming to an agreement concerning the scale of fees for the use of civil aerodromes by the Volunteer Reserve Schools. He mentioned the subsidy which was now being paid to internal airline operators, and the suggestion underlying his remarks was that without the airports the operators could not run their services and that, therefore, the airport owners should receive first consideration. He doubted whether airlines did, in fact, cater for the public; more usually they accepted their passengers with indifference.

The retiring chairman of the Association, Mr. C. M. Newton, proposed the toast of the guests, which was later to be replied to by Mr. Handley Page. The latter, he felt, was not so much a guest as a landlord, since he is president of the S.B.A.C., under whose wing the Association lived. Mr. Newton complained of the ever-increasing demands in aerodrome size, and turned to Mr. Handley Page to provide ways and means by which take-off and landing runs could be shortened. He concluded by making the very sensible suggestion that a committee involving all aviation interests should be set up. Such a committee should reduce the time taken in the passing of information from one section of the aviation community to another. As an instance of slow motion, he gave the case of the Airline Licensing Authority, which had only started work two years after the Maybury Committee had recommended its formation.

Since he was replying for the guests, Mr. F. Handley Page presupposed that he was at liberty to reply also on behalf of the Air Ministry, but for various reasons he waived his claim to make any rash statements on their behalf. More seriously, he praised the foresight of the aerodrome owners, without whom civil flying would have been impossible. We in this country tended to deprecate our achievements, whereas, in fact, we were just as good as any foreign competitors. Fifty years ago the world's markets fell into our laps; nowadays there was competition, but there was no reason at all why we should not still take the cream of the markets. He felt that the Government had lagged behind in failing to encourage where encouragement was due.

This year's chairman of the Association, Councillor J. U. Primrose, proposed the last official toast, which was that to the President. After the reply, Mr. Ashley Hall proposed an unofficial, but nevertheless popular toast to the retiring chairman, Mr. Newton, who was the first private aerodrome owner to hold that position.

SERVICE AVIATION

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

The Boulton Paul Defiant two-seater fighter, described below.

New Two-seater Fighters

OFFICIAL regulations are such that news of important developments is often withheld for so long that members of the public who interest themselves in the equipment of our Air Force become apprehensive. By way of example, a number of letters have been received in this office during the past year or two enquiring as to the progress in the design of two-seater fighters, emphasising that since 1930 the Hawker Demon has remained our standard aircraft in that category.

Only within the last few days has it become permissible to refer to and illustrate our new standard type and another formidable machine in the same class.

A number of R.A.F. squadrons will shortly be equipped with the Boulton Paul Defiant low-wing monoplane with Rolls-Royce Merlin engine. The Defiant is entirely of metal construction, light alloy being the chief material employed. Wings and fuselage have stressed-skin covering, with flush riveting, presenting an exceptionally smooth surface. A slight taper is given to the centre section, the outer wing panels, which have a pronounced dihedral angle, being more heavily tapered and having rounded tips. Split flaps are fitted to the inner portions of the wings and Frise ailerons of high aspect ratio are placed outboard of these. The elevators and rudder are partly horn balanced and have small trimming tabs. The oleo pneumatic undercarriage retracts inwardly into the centre section and is provided with appropriate panels for completing the under-surface of the wing.

The military interest lies chiefly in the concentration of all the armament in a Boulton Paul power-driven gun turret, faired as completely as possible compatible with the provision of a good field of fire. The actual number of guns installed is still undisclosed.

It is to be assumed that the Defiant will be used chiefly for attacking formations of enemy bombers, probably by flying slightly ahead of and below the raiders, who are likely to be comparatively poorly armed in the nose. This form of attack has been demonstrated in public by Demons.

The actual mark of Merlin fitted may not be specified. Assuming that it is a Merlin II as installed in the Hurricane and Spitfire single-seaters it may be guessed that the speed of the Defiant is of the order of 300 m.p.h., considering the drag of the turret and the fact that the dimensions are little larger than those of the Hurricane. Fitted with the Merlin II or X fully supercharged engine, the Defiant should certainly be faster than any comparable two-seater ordered for any foreign Air Force. The use of a Merlin R.M. 2 S.M. two-speed supercharged engine operating on 100-octane fuel (1,145 h.p. at 16,750ft.) would, of course, improve the performance very considerably.

The De Havilland three-bladed variable-pitch airscrew is fitted with a spinner which should give an exceptionally clean entry. The oil cooler is cowled in under the rear of the engine, while the radiator for the coolant is placed under the fuselage, approximately between the pilot's cockpit and the rear gunner's position. The exhausts are of the new "ejector" type.

Main dimensions of the Defiant are: Span, 39ft. 6in.; length, 30 ft.; height, 12ft.; wing area, 250 sq. ft.

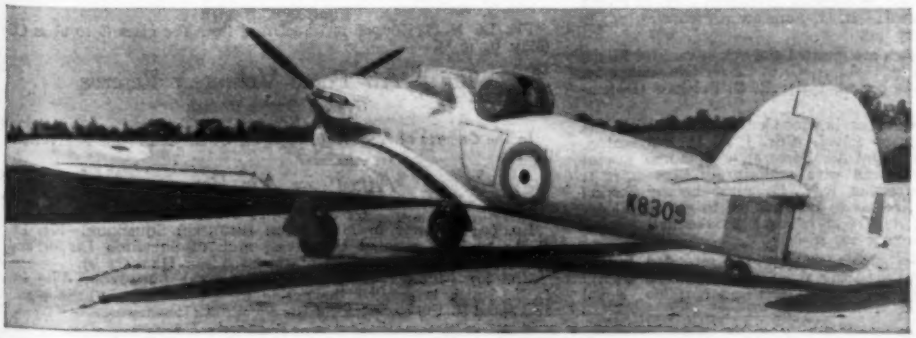
The Hotspur

Hotspur is the name of the second two-seater fighter, preliminary details of which have just been released. This Hawker product is also comparatively small, the dimensions being as follows: Span, 40ft. 6in.; length, 32ft. 10½in.; height, 10ft. 11in. wing area (gross), 261.5 sq. ft. In view of the peculiar shape of the Hotspur's turret the fairings are arranged differently from those on the Defiant. Apart from the inevitable break in this region the machine has very clean-cut lines and gives an impression of great strength, which is accentuated by the placing of the radiator fairing directly beneath the engine, as in the Henley two-seater.

The wings of the Hotspur have Frise ailerons and are of stressed-skin metal construction, but the fuselage is fabric covered.

It appears that the undercarriage is similar to that on the Henley.

The Merlin engine has ejector-type exhausts and drives a three-bladed v.p. De Havilland airscrew.



The Hawker Hotspur two-seater fighter has a turret of an unusual barrel-shaped design.

Service Aviation (Continued)

Lecture on Army Air Arm

THE expeditionary force of the Army needs an air component, which must consist of bombers and fighters as well as of the regular A.C. squadrons. This point was strikingly brought out by Group Capt. A. J. Capel, D.S.O., D.S.C., in a lecture before the Royal United Service Institution last week. The A.C. squadrons, he said, were for tactical reconnaissance, including spotting for the guns, but strategical reconnaissance of the enemy's back areas must be done by bomber squadrons, and he mentioned that some bomber squadrons have been trained in that work. Fighters were also necessary to attack enemy aircraft and to defend our own machines. These fighters and bombers would be under an A.O.C. on the staff of the G.O.C., while the A.C. squadrons would be under the command of divisions or brigades. These bomber and fighter squadrons would have to be taken from the force which had to defend Great Britain, and the Cabinet, after consulting with the Chiefs of Staffs Committee, would have to decide how many squadrons could be spared for the Army. If it were decided that none could be spared from defence work, he thought that the Army would be unable to move overseas until this air support did become available.

Another important point in the lecture was that for low-flying attacks on ground troops the bomb was displacing the machine gun as the weapon, and that the duty was passing from the fighter to the bomber. The lecturer also mentioned the special training which was needed for night reconnaissance, a difficult but important task.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—P/O. Peter Francis Gordon Jameson (flying solo) lost his life in an accident which occurred at Odiham on January 30 to an aircraft of No. 53 (Army Co-operation) Squadron, Odiham, Basingstoke, Hampshire.

P/O. Terence Hugh Knapp O'Brien (flying solo) lost his life in an accident which occurred at Debden, Essex, on February 2, to an aircraft of No. 87 (Fighter) Squadron, Debden, Essex.

Lt. Gordon Clifford Newcombe, R.N. (Flying Officer, R.A.F.) lost his life as the result of a collision in the air which occurred on January 30 off Alexandria, between two aircraft of No. 825 (T.S.R.) Sqn., H.M.S. *Glorious*. The following personnel who were in the aircraft are missing and are believed to have lost their lives: Lt. Richard Arthur William Dobbs, R.N., Flight Lieutenant, R.A.F.; Lt. John Godfrey Lincoln, R.N., Flying Officer, R.A.F.; F/O. Henry Ralph Puzey Bridgen, R.A.F.; Acting Leading Signalman Robert Henry Peerman, R.N.; Leading Seaman Bernard Anthony Coughlin, R.N. Lt. Dobbs and Lt. Newcombe were the pilots of the aircraft.

P/O. Theodore Ralph Tate Carr-Ellison died in Letchworth Hospital, Herts, on January 30 as the result of injuries received in an accident which occurred on January 26 at Baldock, Herts, to an aircraft of No. 54 (Fighter) Squadron, Hornchurch, Essex. He was flying solo.

With reference to the disappearance on January 30 of an aircraft of No. 64 (Fighter) Squadron, Church Fenton, Tadcaster, Yorkshire, the Air Ministry announces with regret that as extensive air and ground searches have failed to find the aircraft and the occupants it must now be accepted that P/O. Stanley John Daly Robinson and P/O. Jack Elliott Thomas lost their lives on that date. They were first and second pilots and the only occupants of the aircraft.

Acting P/O. John Marcus Joseph Poynton (flying solo) lost his life in an accident which occurred near Deir Ballut, Palestine, on February 1, to an aircraft of No. 33 (Fighter) Squadron.

Sqn. Ldr. Geoffrey Henry Owen Mills lost his life in an accident which occurred near Jerusalem on February 3 to an aircraft of the Royal Air Force Station, Ramleh, Palestine. Sqn. Ldr. Mills was the pilot of the aircraft. Mr. Harold Francis Charrington and Mr. Bernard Matthews Timbers, members of the Air Ministry Works Directorate, were the other occupants. The former was not hurt, but Mr. Timbers was slightly injured.

Repeat Orders for U.S. Types

IT is announced that in view of the prospect of improved deliveries for aircraft ordered last year in the United States it has been possible for the Air Ministry to negotiate an increase in the contracts for delivery within the period originally contemplated. The order for the Lockheed Hudson (two Wright Cyclones) has been increased from 200 to 250 and that for the North American Harvard trainer (Pratt and Whitney Wasp) from 200 to 400.

Eight-Gun Faireys for Denmark

FOR use mainly as a two-seater fighter the Danish Navy has adopted a specially developed version of the Fairey P.4/34 two-seater low-wing monoplane, originally produced for the British Air Ministry as a high-speed bomber.

The type is to be built in Denmark under licence, and will be equipped with eight machine guns, making it the most heavily armed single-engined two-seater in the world.

Special flaps, intended to keep down speed in the dive, will also be incorporated, from which it may be inferred that dive bombing will be one of the functions of the new machine.

It may be recalled that with a Merlin I or II the original bomber version was capable of speeds between 280 and 290 m.p.h.

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General Duties Branch

A.V-M. C. F. A. Portal, C.B., D.S.O., M.C., is appointed Air Member for Personnel on the Air Council, vice Air Marshal Sir William G. S. Mitchell, K.C.B., C.B.E., D.S.O., M.C., A.F.C. (February 1); Air Comdre. D. G. Donald, D.F.C., A.F.C., is appointed Director of Organisation, Air Ministry, vice A.V-M. C. F. A. Portal, C.B., D.S.O., M.C. (February 1).

Flt. Cadet D. H. W. Hanson, having successfully passed through the Royal Air Force College, Cranwell, is granted a permanent commission as Pilot Officer on probation (December 17, 1938).

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—F. W. Dixon-Wright, J. Grandy, A. Pyke, G. H. O. Mills, E. F. Porter, F. H. Tyson, R. H. E. Emson, M. F. D. Williams, S. P. Langston, T. F. U. Lang, R. Sorel-Cameron, J. Worrall, W. P. Sutcliffe, R. C. M. Collard, N. G. Goodman, R. G. E. Catt, R. H. A. Leigh, J. N. H. Whitworth, G. P. Woodhouse, A. W. Geoghegan, W. H. N. Turner, J. S. Sabine, P. I. Harris, A. D. Grace, A. Threapleton, T. A. B. Parselle, P. S. Gomez, M. B. Hamilton, A. C. Martin, W. S. P. Simonds, W. P. Harvey, D. V. Johnson, A. W. Sweeney, R. S. Ryan, A. R. Glencross.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—D. E. Cattell (Acting Flight Lieutenant) (January 12); J. W. Arney, P. T. Philpott (Acting Flight Lieutenant), C. D. Hockett, T. B. de la P. Beresford, D.F.C. (Acting Flight Lieutenant) (January 27).

The following Flying Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—R. G. Forshaw (October 23, 1938); N. M. Hall, A.F.C. (January 14).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—L. A. G. S. Lewer (November 25, 1938); A. G. Dudgeon (November 28, 1938); R. G. Forshaw (December 23, 1938).

Sqn. Ldr. N. C. Ogilvie-Forbes is seconded for duty with the Royal Iraqi Air Force (January 20); Lt.-Cdr. J. A. D. Wroughton, R.N., is re-attached to the Royal Air Force as a Squadron Leader with effect from January 16 and with seniority of September 1, 1938; Lt.-Cdr. J. H. F. Burroughs, R.N., Squadron Leader (Acting Wing Commander), R.A.F., ceases to be attached to the Royal Air Force on return to Naval duty and relinquishes the acting rank of Wing Commander (December 29, 1938).

The following Flight Lieutenants cease to be seconded to the Royal Air Force on return to Army duty (January 21):—J. W. Deacon (Captain, Worcester Regiment); R. Leigh (Captain, Royal Artillery).

Equipment Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—J. E. V. Tyzack, R. C. Storrar, P. H. Wilcox.

Accountant Branch

F/O. on probation C. H. Leggott, D.C.M., is confirmed in his appointment (December 13, 1938).

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—E. L. G. Le Dieu, B. Chadwell.

Medical Branch

F/O. A. W. St. C. Greig, M.B., Ch.B., is promoted to the rank of Flight Lieutenant (November 22, 1938).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following are granted commissions in class CC as Flight Lieutenants on the dates stated:—Lt.-Col. L. H. Morse, M.C. (I.A., Ret.) (October 29, 1938); Lt.-Col. J. A. Ferguson, O.B.E. (I.A., Ret.) (November 10, 1938); Capt. E. L. Stokes (R.A.R.O.) (November 28, 1938).

F/O. T. J. Shaw, R.A.F.O., is granted a commission in class CC as Flying Officer with the acting rank of Flight Lieutenant (October 12, 1938); Sqn. Ldr. (Honorary Air Comdre.) J. B. Bowen, C.B.E. (Air Commodore, R.A.F., Ret.), is granted the rank of Wing Commander (Honorary Air Commodore) in class CC (October 7, 1938); Flt. Lt. D. R. Sharman, M.C., relinquishes his commission on completion of service (December 7, 1938).

Equipment Branch

Flt. Lt. N. S. Roupell is transferred from the class C to class CC (May 7, 1938).

Royal Air Force Volunteer Reserve

General Duties Branch

Erratum

In the *Gazette* of August 16, 1938, for B. E. Jones read B. Everton-Jones.

Auxiliary Air Force

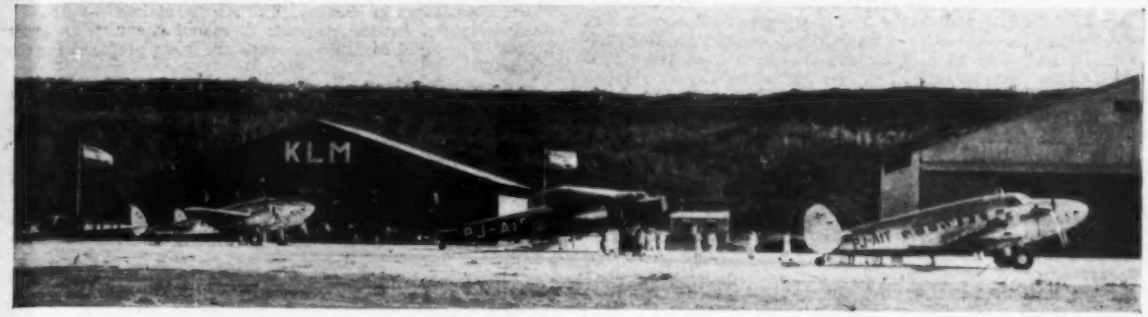
General Duties Branch

No. 604 (COUNTY OF MIDDLESEX) (FIGHTER) SQUADRON.—Flt. Lt. R. A. Budd is granted the acting rank of Squadron Leader and appointed to the command of the squadron (January 1).

No. 607 (COUNTY OF DURHAM) (FIGHTER) SQUADRON.—Flt. Lt. L. E. Smith is granted the acting rank of Squadron Leader and appointed to the command of the squadron (January 1).

Owing to the greatly increased length of these lists, as a result of R.A.F. expansion ranks are confined to those of Flight Lieutenant and above.

COMMERCIAL AVIATION



K.L.M. IN THE WEST INDIES : Hato aerodrome, Curaçao, with two K.L.M. Lockheed 14s and one of the Fokker F.18s which have been used by the company since the services started after the first F.18 had been flown across the South Atlantic.

THE WEEK AT CROYDON

"A. Viator's" Critical Commentary on Airport and Airline Affairs

BRITISH AIRWAYS, LTD., were still operating to and from Croydon last week (Heston having been waterlogged), and towards the end of that period practically all signs of sogginess had disappeared, thanks to the rapid natural drainage of our chalk soil at Croydon.

It was never really bad, in spite of the odd machine getting bogged in a fairly well-known swampy corner; and to deduce a shockingly soft surface from one wet patch is typical of the modern newspaper reporter, who frequently writes before he thinks. As well walk into the Thornton Heath pond on the way home from a party and then, despite the good, dry highway, announce that Thornton Heath is flooded.

It is curious how, on some damp, misty days, the Croydon smoke smudge lays a trail of thick, white fog right across the landing area from one side to the other. From the ground it looks like a formidable fog bank, but pilots say that it looks worse than it is and does not interfere with landing.

Up North

Someone was telling me about the internal airlines, especially up North, and of the amazing regularity of the services in every sort of unfavourable weather and in spite of lack of essential radio and navigational assistance. Pilots not only put up a wonderful show on some of these lines, of which we rarely hear much, but they are not above ticket-collecting, giving a hand with the baggage, heaving a fat farmer or market woman up the steps into the cabin, and so forth.

Three gold cuff-bands up North do not necessarily mean "Touch me not, damme! I'm the Captain. Can't you see my shammy leather gloves?" Mind you, I think a little of that attitude, coupled with a really smart, well-groomed appearance, is an asset on the London Continent lines, but where your clients are farmers in muddy leggings, drovers, dairymaids a-marketing, and so forth, it would not be sense. The farming folk very sensibly treat the aeroplane ride like a bus ride themselves, and they would not expect to find the Captain of the *Queen Mary* driving their market bus.

One or two newspapers begin to wax enthusiastic about Fairlop and Lullingstone already. Neither of these airports is supposed to be ready until 1942, when Croydon is to be temporarily put out of action for renovation.

Meanwhile, new hangars are being put up at Croydon by the better-late-than-never boys, to whom we went on our bended knees for such accommodation about ten years ago.

What seems likely to happen now is that these hangars will just about be ready in 1942 when both they and the rest of the buildings here will be pulled down and new ones erected in a more suitable position.

Perpetual Motion

It will be a bit awkward if the last roofing tiles are being placed in position on the new hangars on the very day the gang comes along to start tearing them down.

You get something closely resembling perpetual motion (allowing time off for meals, of course) if A removes the last tile under instructions from the Directorate of Demolition every time B, taking his orders from the Directorate of Construction, solemnly lays it in place.

A newspaper describes the present derelict state of the Lullingstone site in the following picturesque words:—

"A scarecrow, drying its tattered jacket in the afternoon sunshine, still stood on the site where one day a traffic controller may greet a flying liner from some far corner of the Empire."

That would not be a scarecrow, laddie, but an advance party of Works and Bricks brooding over the possibility of digging a series of holes in an otherwise excellent landing area and marking them with obstruction boards. W. and B. are firmly convinced that awkwardly placed excavations are as essential to an airport as bunkers are to a golf course.

Last Thursday the English ice hockey team flew from Croydon to Zurich, where (and at Basle) the world championship is being played. They travelled by Swissair.

TRAINING FOR TO-DAY

ALTHOUGH Air Service Training activities have, during the past year, been largely concerned with turning out Reserve pilots at Hamble and Anstey, the ordinary commercial training courses continue as usual. At the end of last year twenty-seven students were engaged on the three years' commercial pilots course and thirty-two on the two years' ground engineering course. The work in transport training is now considerably assisted by the fact that the Hamble fleet includes no fewer than seven multi-engined machines of different types, including an Avro Avalon and one Airspeed Envoy, and that, during the year, an Adcock type of D/F receiver was installed at Hamble for instructional purposes. Altogether, far from easing up on the commercial side, A.S.T. are expanding and are making a special point of providing really adequate blind-flying and blind-approach training to suit modern transport conditions.

COMMERCIAL AVIATION (CONTINUED)

Airworthiness

AFTER an informal dinner on February 13 at 8 p.m., a discussion dealing with "Airworthiness and the Air Registration Board" will be held by the G.A.P.A.N. at the Royal Aero Club. This discussion will be opened by Dr. H. Roxbee Cox, and pilots who are not members of the Guild will be welcomed provided that they notify the G.A.P.A.N. secretary beforehand.

Together at the B.I.F.

FOR the first time Imperial Airways and British Airways will be combining at the British Industries Fair, where they will be exhibiting a map showing the projected route from London to West Africa and across the South Atlantic, as well as those from Hong Kong to Shanghai and from New Zealand to Western Canada. Imperial Airways will also be exhibiting on the Newfoundland Government's stand.

London's Airports

ANSWERING a question by Mr. Perkins in the House on February 1, Capt. Balfour said that the large-scale programme of development work at Heston aerodrome was now proceeding, and that this programme should be completed by 1942. At the same time the Fairlop aerodrome, which is being developed by the City Corporation, was, he said, likely to be ready within the next three years.

As soon as these two airports were available it would be possible to close Croydon for major improvements to the surface and to the buildings. It was, however, clear that the increase in air traffic would necessitate the provision of yet another land airport and negotiations were now in progress for the purchase of a suitable area at Lullingstone, Kent. It will be remembered that this is the area in which the Southern Railway was originally interested.

Maybury Airport in Scotland?

THE new aerodrome which is being laid out by Scottish Aviation at Grangemouth for Volunteer Reserve and similar use, may eventually, it appears, become a central airport serving Edinburgh and Glasgow. Grangemouth actually lies an equal distance between these two cities and it is reported that North Eastern Airways, who at present run to Edinburgh from London, are likely to make use of it as soon as it is ready—which will be during May.

Certainly the aerodrome is more than adequate in size. The runs in all directions are in the vicinity of 1,500 yards, and there is provision for a bad weather run of 1,850 yards. The disadvantage of its distance from the two main centres in Scotland may be outweighed by the aerodrome's size and eventual facilities. Scottish Aviation, it will be remembered, has been running a Reserve School at Prestwich, Ayr, for more than two years.

Atlantic Competition—and Co-operation

WHILE Imperial Airways expect to start this year's Atlantic experimental flights on or about June 1, it has been stated in America that Pan-American Airways may be able to make a start somewhere towards the end of next month.

Replying to a question in the House on February 1, Capt. Balfour explained that the necessary permits for the operation of a regular service by Imperial Airways and Pan-American Airways over the North Atlantic were issued in 1937, but that the establishment in the United States of the new Civil Aeronautics Authority has made it necessary for Imperial Airways to apply for a new permit. Such an application has, of course, been made. Capt. Balfour added that though this country had hoped that the start would be simultaneous, no obstacle would be put in the way of Pan-American Airways if they cared to start earlier than June 1.

The agreement which Pan-American Airways completed with the French Government on January 20, by which that company and Air-France will co-operate on a strictly reciprocal basis in running a series of mail-carrying flights across the North Atlantic between the United States and France, is likely to result in these two companies being first in the field in the North Atlantic crossings this year. The French company may have to take over one of the Boeing 314 flying boats pending the completion of the French transatlantic machines.

It is reported in New York that the first of these flights will start on the 18th of this month, the terminal points being New York on the American side and Biscarosse, in the Landes Department of France, on the European side. The Etang de Biscarosse, some fifty miles south of Bordeaux, is one of the finest bases in France. The airport at Bordeaux is also being prepared for the Atlantic flights of the Farman landplanes and special concrete runways are being prepared for the purpose.

Although Pan-American Airways have one, or perhaps two, of their new Boeing 314 boats ready for action, it is difficult to see how, even with all six of those ordered, and with the available Martin boats, it will be possible for them to operate regular services across the Atlantic, across the Pacific to Hong Kong, and southwards to New Zealand. It has already been announced in New Zealand that the first of the Boeings will be used for the service to Auckland. Editorial comment on this and kindred matters appeared last week.

Imperial Additions

IMPERIAL AIRWAYS have just placed an order for two more of the Frobisher class of landplanes—better known to the majority as the D.H. Albatross type. These two machines, which have no doubt been ordered at this particular moment largely because of machine-shortage difficulties following the withdrawal of the Ensigns from service, are expected to be delivered almost immediately. In spite of all the criticisms which have been made, it must be said that Imperials are now operating the fastest commercial machines in regular service. With new engines, the Ensigns may also be the fastest *and* the most comfortable.

An Unusual Imperial Occasion

AIRLINE operators and representatives of the Press were invited last week to witness an unusual and pleasant little ritual—the handing over of a Royal Humane Society Certificate for life-saving by Sir John Reith, chairman of Imperial Airways, to the London manager of Air France, Mr. Jack Bamford. As Sir John said in a brief speech, Imperials, in one of its wiser moments, saw fit to break away from the usual procedure connected with the presentation of a life-saving certificate—wherein the rescued hands over the certificate to his rescuer. It had decided that it should undertake the presentation on behalf of a respected member of the company, Mr. Snowden Gamble, whose life was saved by Mr. Bamford when the two, unknown to each other, were bathing at Frinton last year.

With due ceremony, Sir John handed over the certificate to a very bashful Mr. Bamford, whose reply could scarcely be heard, even above the faint clinking of cocktail glasses. All the while one could not help but sympathise with Mr. Gamble, who still looked far from well—he had contracted pneumonia after being rescued, a fact which Sir John had raised as proof that there had been no collusion.

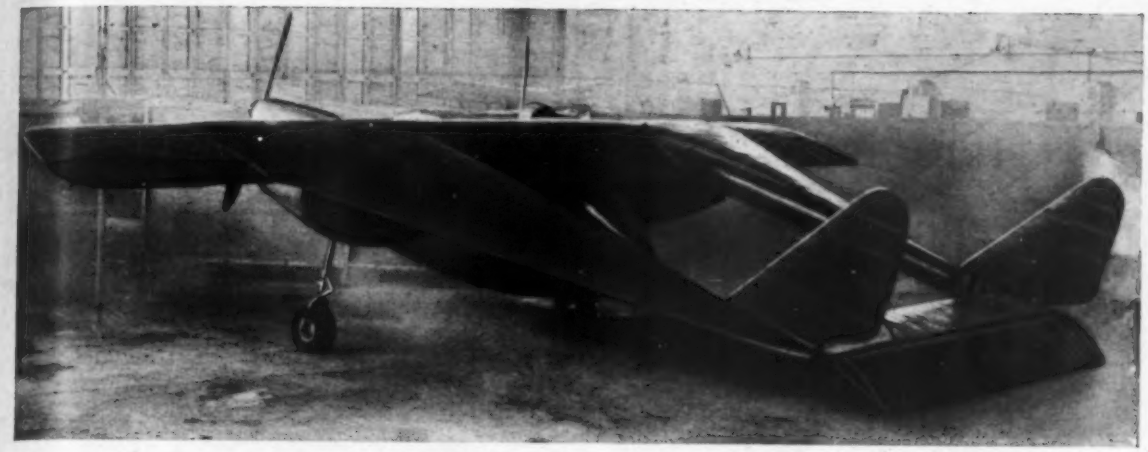
Skal Again

SINCE last year's Skal Club dinner in London four more centres have been formed in Boston (United States), Riga (Latvia), Belgrade (Jugoslavia) and—Birmingham. Two more, at Saigon and Hanoi, in Indo-China, are on the way towards formation. Although, outwardly, the organisation of Skal clubs is one purely of international amity and general goodfellowship, it has to be admitted in one's more cynical moments that it is a magnificent device for fostering the tourist trade. In fact, the membership is solely confined to those concerned with the travel business, whether that of selling tickets or of operating transport companies of one kind or another. The interesting thing is that transport operators as a whole are represented very largely by air travel organisations.

At this third annual dinner and dance Sir Douglas Hacking, the Vice-President of the Constructional and Industrial Development Association of Great Britain and Ireland, confidently echoed Mr. Neville Chamberlain during his speech in proposing the toast of the London club. He said that there were two means of securing peace in the world, and these could be briefly described under the heading of Strength and Skal. In other words, it was necessary to extend the right hand in friendship while holding a large stick in the left hand.

Mr. E. Huskisson, one of the vice-presidents of the London club and the recently appointed managing director of Cooks, stressed the importance of the second means to peace. In the end the travel and hotel people did more for international good feeling than for anyone else.

Once again Mr. R. W. Waigh, of Imperial Airways, was in the chair, and the toastmastering business was ably and professionally looked after by Mr. H. A. Ostelius, of A.B. Aerotransport. In fact, air transport was very much to the fore.



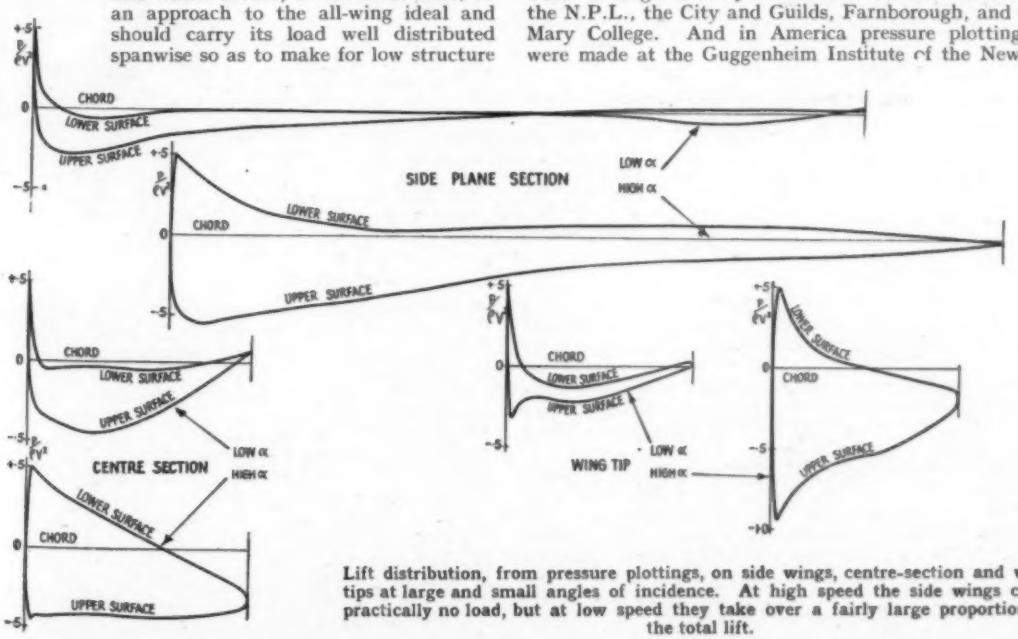
DELAYING the STALL

Flight Tests of Compound Aerofoil About to Begin : Willoughby Delta 8 as Flying Scale Model of Large Passenger Machine, Delta 9

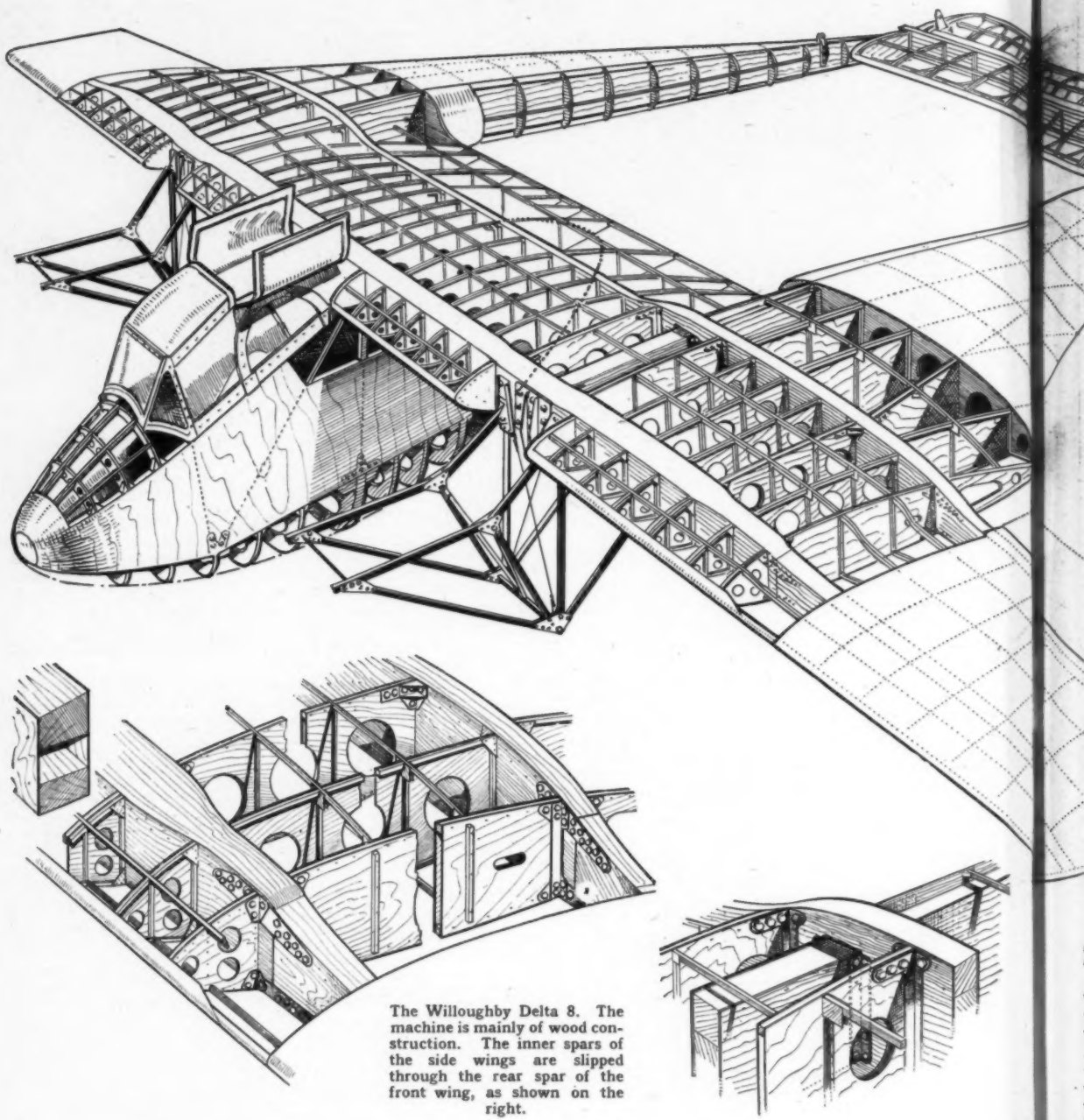
RATHER more than a year ago, on November 18, 1937, to be exact, *Flight* published a brief advance description of an interesting project which is now about to become a reality. In that issue of *Flight* we gave the general arrangement drawings of a small two-seater designed and to be built by the Willoughby Delta Company, of 20, Kingsway, London, W.C.2. That the construction of this machine has taken so long is due in part to the fact that it was desired to obtain results of extensive pressure plotting tests with a wind tunnel model before completing the actual machine. In the meantime these tests have been made and the two-seater, which has been named *St. Francis*, is now all but ready for its flight tests at Witney aerodrome, Oxford, where it has been constructed.

It should be explained at the outset that the two chief aims in the design were to provide an airform which should be, for all practical purposes, free from the vice of stalling, and which should, at the same time, be an approach to the all-wing ideal and should carry its load well distributed spanwise so as to make for low structure weight. The all-wing idea was, of course, first suggested in the now-famous Patent of the late Professor Junkers, taken out in 1909 or 1910. Even if a longitudinally stable wing is produced, by using a reflexed curvature, it is necessary, in the ordinary high-aspect ratio wing, to go to a very large size before sufficient headroom can be provided within the wing.

With the airform developed by the Willoughby Delta Company there is an opportunity of approaching the all-wing ideal without introducing an excessive size. Much research work was necessary before even the small machine, which is intended as a flying scale model of the large type contemplated, could be designed and built with any assurance that it had no unsuspected tricks. The plan form is so unusual that stability and control data derived from orthodox aeroplanes were of little use as a guide. Mr. Willoughby has had very extensive wind tunnel tests made both in this country and in America. Tests in England include such research establishments as the N.P.L., the City and Guilds, Farnborough, and Queen Mary College. And in America pressure plotting tests were made at the Guggenheim Institute of the New York



Lift distribution, from pressure plottings, on side wings, centre-section and wing tips at large and small angles of incidence. At high speed the side wings carry practically no load, but at low speed they take over a fairly large proportion of the total lift.



The Willoughby Delta 8. The machine is mainly of wood construction. The inner spars of the side wings are slipped through the rear spar of the front wing, as shown on the right.

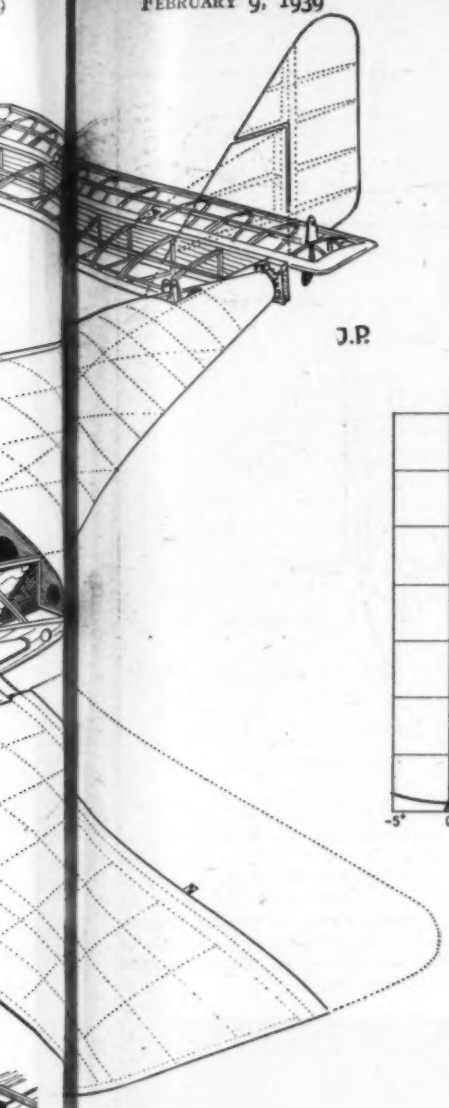
University. Thus it will be appreciated that the inventors of this particular type of airform have not been content to leave to guesswork anything which could be settled by model tests.

There are, however, several features which can only be tested thoroughly by actual flying tests, and for this purpose the little two-seater, Delta 8, now almost ready to fly, was designed and built.

Pressure plottings have indicated that at small angles of incidence, that is to say at high speed, the main wing carries most of the load, the "side wings" serving mainly as fairings for the tail booms. At large angles, however, the airflow changes and the side wings carry a greater proportion of the total load. This is illustrated in the pressure plotting diagram on the previous page. By using a symmetrical section for the wing tips of the front wing it has been found possible to delay the stalling of the tips until quite large angles of incidence are reached; this, of course, results in a retention of lateral control at large angles.

That the stall has been rendered fairly innocuous is shown by the lift curves on p. 145. Although a maximum lift is reached at an angle of about 16-18 degrees, the drop in the lift curve is very gentle, and the subsequent rise tends to restore the small amount of drop at still greater angles. Although the airflow around such a form as the Delta is unusual and somewhat difficult to follow, it appears that at large angles the front wing begins to stall, but the increase of lift on the side wings prevents the sudden drop in the overall lift coefficient curve which one associates with the orthodox high-aspect ratio wing.

It is a matter of some difficulty to assess such things as



lift coefficient and form drag. For calculating the former one must take some specific wing area, and in the Delta it is possible to include or omit so many portions of the airform that there is no really satisfactory basis. If one includes the area of the front wing only, the lift coefficient is probably high, but if the total projected area is used it may appear somewhat low. In the large size, for which the design was developed, that would give an unfair picture, because the side wings are used as passenger accommodation.

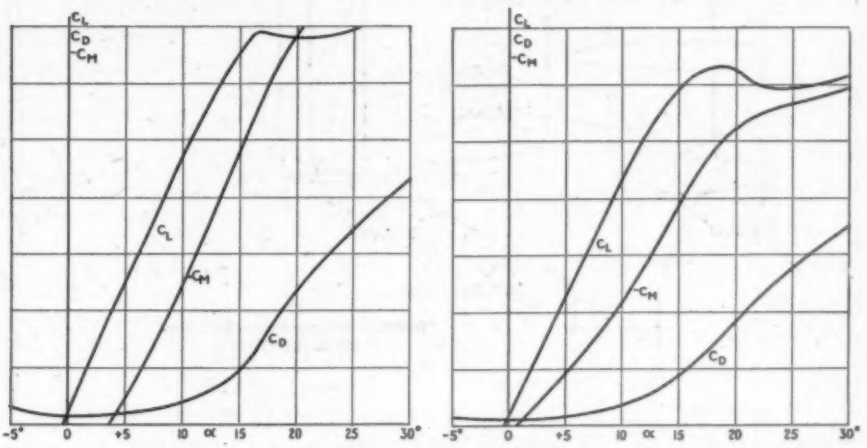
To get an idea of the "wetted area" figure, one may take as a basis the number of sq. ft. per lb. of gross weight. This amounts, in the large 38,000 lb. machine, to 0.1695. By way of comparison the De Havilland Albatross may be quoted. As a passenger-carrier at 29,500 lb. gross weight, this machine has 0.135 sq. ft. of wetted area per lb. of gross weight. It therefore appears that the surface area of the Delta is relatively greater, but against that must be set the fact that the side wings should count as fuselage area, which is non-productive of lift in the orthodox aeroplane.

The little two-seater which has been built as a flying model of the large commercial machine is fitted with two Menasco Pirate C.4 engines of 125 h.p. each. The cabin is slung below the front wing, with the occupants seated tandem-fashion. The construction and, incidentally, the curious form caused by the intersection of the front wing with the side wings are well shown in the sketches. The construction is of wood, even to the engine fairings, which have been found to be extremely light. The undercarriage does not retract, the Palmer wheels being carried on cantilever struts.

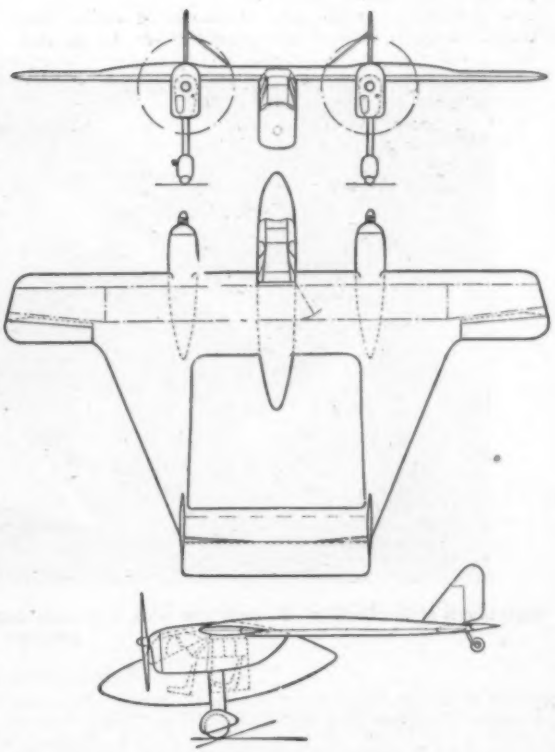
Except as an indication of the drag of the machine, performance figures are of little value when applied to the small machine, which was built for demonstrating the principle rather than as a practical aeroplane. It is estimated that the top speed will be in the neighbourhood of 185 m.p.h. The machine is, however, less clean that the large commercial type.

Known as the type Delta 9, the larger machine will have a gross weight of 38,000 lb. and will have accommodation for 18 passengers in each of the two side wings. Its general lines are shown in the drawing (p. 146), and in the photograph of a scale model. The intention is that three liquid-cooled engines of 1,000 h.p. each should be used. Each cabin is 18ft. long, 8ft. wide, and with a central gangway giving not less than 6ft. headroom. Retractable undercarriages are to be fitted, and a special design has been prepared, for which the company holds a patent. A tricycle arrangement could be incorporated.

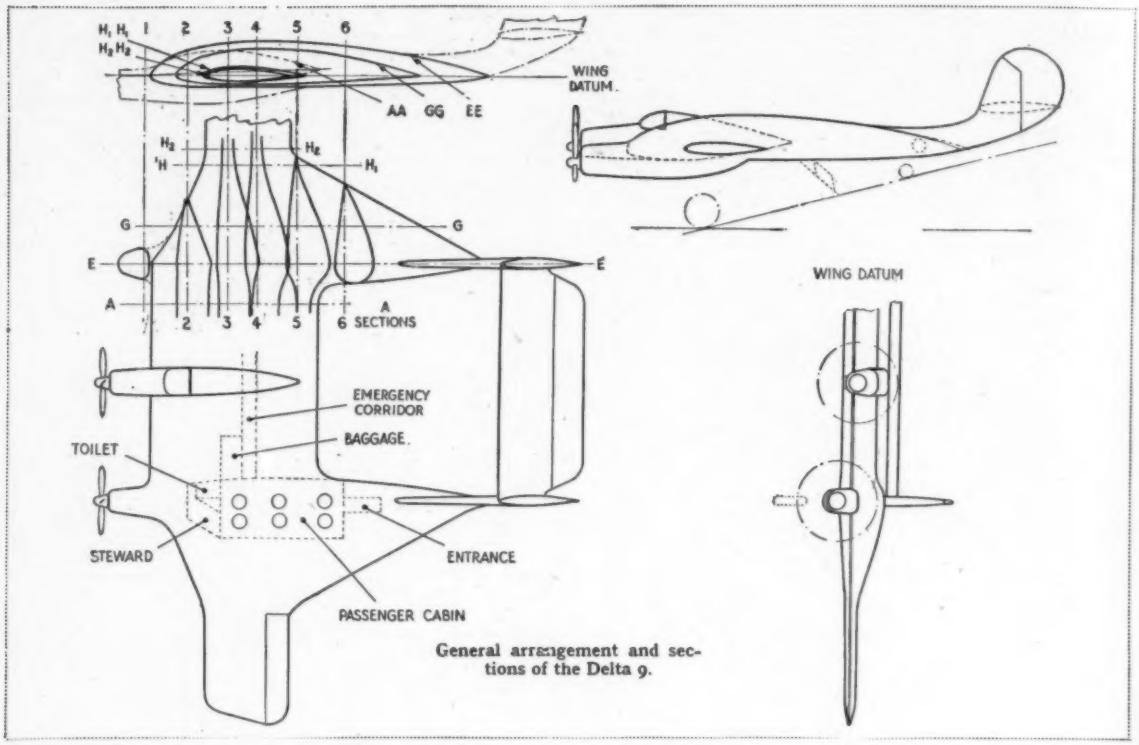
Owing to the distribution of the load, a low structure



Lift, drag and centre of pressure curves of the Delta 8 (left) and Delta 9. Note the flat top of the lift curve.



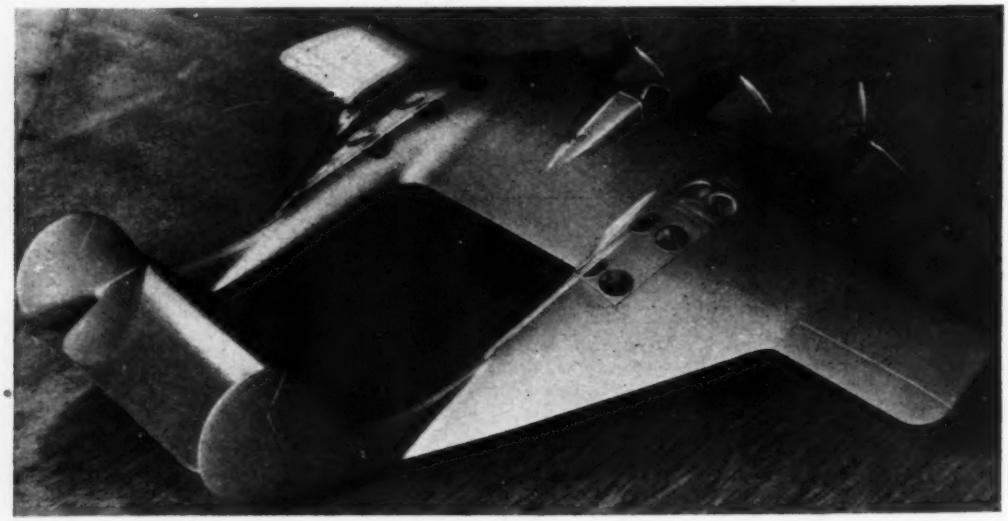
General arrangement of the Delta 8.



General arrangement and sections of the Delta 9.

weight is achieved, and it is estimated that the Delta 9 should carry as disposable load approximately the equivalent of its tare weight. That has, of course, been achieved before in orthodox aircraft, but never before, so far as we are aware, in a machine which does not stall, in the ordinary sense of the term.

How passengers would take to cabins in which they obtained no direct view of the ground is another matter. Mr. Willoughby has schemed out an arrangement of lenses and ground glasses in the tables of the cabin whereby passengers would be provided with a reduced but very brilliant view of the ground below them. As the tendency seems to be towards flying at greater heights, at which nothing much can be seen anyway, it may be that the question of view for passengers will be regarded as of minor importance in the future.



Scale model of the Delta 9. In each side wing is a cabin seating 18 passengers. Three liquid-cooled engines of 1,000 h.p. each are foreseen.

R.Ae.S. Lecture on Ignition

NEXT Thursday, February 16, Dr. G. E. Bairsto will lecture before the Royal Aeronautical Society on "Some Factors Controlling the Development of Ignition on Aero Engines." Dr. Bairsto will review ignition developments to meet the conditions which now exist due to the adoption of 87- and 100-octane fuels, higher speeds and higher altitudes of operation The characteristics of present-day magnetos are considered and coil ignition and other alternatives are reviewed. The paper also deals with sparking plugs, cables, and screening.

The lecture, which will be very fully illustrated, will be given in the Lecture Hall of the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, at 6.30 p.m.

THE ROYAL AERO CLUB

News and Official Notices for the Week Ended February 4

C.A.G. Suggestions

A PROPOSAL has been put forward by the Executive Committee of the General Council of Associated Light Aeroplane Clubs which has for its object the further stimulating and extending of the already very successful C.A.G. scheme.

A request has been forwarded to the Air Ministry which, if it is acceeded to, will enable large numbers of new aircraft to be bought and allow new and existing clubs to create and extend their facilities for training.

It is suggested that loans should be made to the clubs for the express purpose of buying new aircraft, and that the loan should be repaid by appropriate deductions from the subsidy earned.

It is appreciated that the Treasury must be fully covered against possible loss, but it is believed that there will be no insuperable difficulty in arriving at an agreed simple system of loans and repayments.

Gliding and National Defence

AT the request of the Air Ministry, the British Gliding Association, as far back as October last, submitted a scheme for the accommodation and training of Air Defence Cadets at summer gliding camps, to be organised by the clubs at the larger gliding centres throughout the country. So far the only doubtful satisfaction that the gliding movement has received is a non-committal "The question is still under consideration."

Gliding clubs cannot be expected to commit themselves by placing orders for additional gliders while the general position as to what services would be required of them remains uncertain.

One of the Air Defence Cadet squadrons, in desperation owing to lack of official support, has decided to strike out on its own with the object of playing a part in training for national defence. It is prepared to supply its own equipment and begin training amongst its members.

Trip to Tripoli

WHAT is believed to be the first aerial "bumping" race—without the bumps—ever held is arranged to take place during the Fourth Sahara Rally, which is being organised this year at Tripoli by the Reale Unione Nazionale Aeronautica d'Italia.

Particulars received this week by the Royal Aero Club indicate that it is one of a series of tests to which aircraft participating in the Fourth Sahara Rally at Tripoli will be subjected. The rules indicate that the aircraft taking part in this test will be started from the ground, the motor being running. They will leave at handicap intervals, and each place lost or gained will add, or detract, 1 point from the competitor up to a maximum of 3 points. Other tests include a navigation exercise and reliability and speed competitions.

The Sahara rally is open to touring aircraft of between 100 and 950 total h.p., and it will take place between March 5-12. Entry fees are 100 lire per person. This covers also board and lodging expenses at Ghadames and Hun. Entries close on February 25, but late entries will be accepted up to March 1 at double entry fees.

Full particulars will be supplied on application to the Secretary, the Royal Aero Club, 119, Piccadilly, W.1.

Air News

FRENCH SOMALILAND.—*Jibuti* aerodrome is being levelled.

POLAND.—A temporary wooden tower, 16 m. high, has been erected to the S.E. of *Warsaw-Okecie* aerodrome. Pilots are warned that it is almost in the line of flight of aircraft landing by the ZZ procedure.

SWEDEN.—Blasting operations immediately N.W. of *Bromma* aerodrome have been resumed on week-days. A red flag is flown on the control tower 5 min. before the period when blasting operations will take place, and the "landings prohibited" signal is also displayed.

International Aviation Fixtures

The International Aeronautical Calendar for 1939 has been agreed by the Fédération Aéronautique Internationale as follows:—

March 5-12.—*Reale Unione Nazionale Aeronautica d'Italia:* Fourth Sahara Rally, Tripoli.

April 11.—*Aero Club de France:* International Meeting at Cannes.

May 14.—*Aero Club of Switzerland:* Balloon competition during the Swiss National Exhibition at Zurich.

May 14-20.—*Polish Aero Club:* Meeting of the I.S.T.U.S. and gliding competitions at Warsaw and Katowice.

July 8-23.—*Brussels:* Second International Aeronautical Exhibition.

July 16-23.—*Reale Unione Nazionale Aeronautica d'Italia:* Littorio meeting, Rimini.

July 29-30.—*Aero Club von Deutschland:* Second International meeting of the N.S. Fliegerkorps.

September 4.—*Polish Aero Club:* Gordon Bennett balloon race.

October 1.—*Aero Club de France:* Coupe Deutsch de la Meurthe, Etampes.

In addition, the dates for international model competitions have been fixed as follows:—

July 17-23.—King Peter II Cup, Heath Row Aerodrome, London.

August 6.—Wakefield Cup, in the U.S.A

August 7.—Bowden Challenge Trophy, Heath Row Aerodrome, London.

August 13-15.—Prize given by the President of the French Republic, Banne d'Ordanche.

Aviators' Certificates

No.	Name.	Club or School.	Date.
16,945	Peter Inglis Hall	Lancashire Aero Club ...	22. 1.39
16,946	Henry Francis Nicholson ...	London Transport (C.B.) Sports Assn. Flying Club.	25. 1.39
16,947	George Evelyn Farquharson ...	Bristol and Wessex Aeroplane Club.	18. 1.39
16,948	Leslie Stuart Walton	Cambridge Aero Club ...	24. 1.39
16,949	Harold James Gearing	No. 23. E. and R. F.T.S. Rochester.	25. 1.39
16,950	Frank Bull	Southend Flying Club ...	26. 1.39
16,951	Bernard Godwin Reeve	Southend Flying Club ...	26. 1.39
16,952	Ronald Caunter Foyster ...	Southend Flying Club ...	20. 1.39
16,953	Eric Livingstone Tulloch ...	Misr Airwork Flying School	24.12.38
16,954	Reginald George Phipps ...	Southend Flying Club ...	13. 1.39
16,955	Thomas George Jefferson ...	Ipswich Aero Club ...	27. 1.39
16,956	Maurice Robert Liffen	Ipswich Aero Club ...	28. 1.39
16,957	Donald Kenneth Geddes ...	Witney and Oxford Aero Club.	28. 1.39
16,958	Albert Martin Strathdee ...	Scottish Flying Club ...	26. 1.39
16,959	Ernest Edward Fail	Newcastle-on-Tyne Aero Club.	29. 1.39
16,960	Frank Kelham Barnett	Redhill Flying Club ...	27. 1.39
16,961	Clifford William Holt	County Flying Club ...	29. 1.39
16,962	Edward Pugliese	London Aeroplane Club...	22. 1.39
16,963	George Pirie	Scottish Flying Club ...	28.12.38
16,964	Gordon Alexander Richmond ...	Scottish Flying Club ...	1. 2.39
16,965	Patrick Herbert Harold Thirkell ...	Barnstaple and N. Devon Flying Club.	19. 1.39
16,966	John Reginald Eyre Stagg ...	Ipswich Aero Club ...	8. 1.39
16,967	Joseph Bird	Border Flying Club ...	1. 2.39
16,968	Margeurite Elsie Lowcock ...	Bournemouth Flying Club	2. 2.39
16,969	Ernest Henry Samson	Bournemouth Flying Club	2. 2.39
16,970	John Evelyn Swaine	Bournemouth Flying Club	1. 2.39
16,971	William Alexander Loudon ...	Bournemouth Flying Club	1. 2.39
16,972	William McElrea...	Bournemouth Flying Club	2. 2.39
16,973	Frank Wittwer Barling	Kent Flying Club ...	26. 1.39
16,974	Edgar Ernest Hawkes	Kent Flying Club ...	31. 1.39
16,975	Rupert William Lukey	Kent Flying Club ...	1. 2.39
16,976	Herbert Sidney Leigh	Coventry Aeroplane Club.	21. 1.39
16,977	Edward Hopton Platt	Liverpool and Dist. Aero Club.	24. 1.39
16,978	Ronald Edward Charles Ebsworth	Herts and Essex Aero Club.	2. 2.39
16,979	Kenneth Hamilton Leist ...	Worcester Flying Club ...	24. 1.39

"From the Clubs and Schools"

OWING to extreme pressure on space, this week's notes on flying club and school activities are unavoidably held over until next week.

THE INDUSTRY

An Old-timer Takes a Rest

HIS friends in the aircraft industry will be interested to learn that Mr. W. H. Mace has resigned from Folland Aircraft and is for the time being taking a well-earned rest. That his long experience of works management, first for very many years with the Hawker company and afterwards with British Marine before it became Folland Aircraft, will be allowed to lie fallow for any length of time in the present condition of industry is, of course, unlikely.

The Westland Dance

A WORKS social function which gains annually in importance and size is the Westland Aircraft dance, held this year at the Manor Hotel, Yeovil, on January 27 with a large and gay company of dancers and a first-class band.

Owing to long-standing engagements, Lord Aberconway, the chairman of the company, and several of the directors, were unable to attend. The company, however, was well represented by the presence of Capt. and Mrs. Peter Acland, Mr. and Mrs. W. E. W. Petter, Mr. and Mrs. E. Mensforth and Mr. and Mrs. W. B. Hickman. Petters, Ltd., was represented by Mr. E. P. Wrinch and Mr. and Mrs. P. C. Sharp.

The hon. secretary of the dance committee, Mr. A. G. Dodge, and his colleagues deserve congratulation.

Structural Steel Specialists

AN imposing hangar has been recently built at Woolsington, Newcastle's municipal airport. The hangar, which was designed to deal with both present-day conditions and future expansion, is of steel construction with six large sliding doors that can be opened out on either side to clear the hangar walls.

In many respects it was fitting that the Newcastle authorities should have entrusted the contract for the building of the hangar to the oldest firm of steel structural engineers on Tyneside—Wright, Anderson and Co., Ltd.

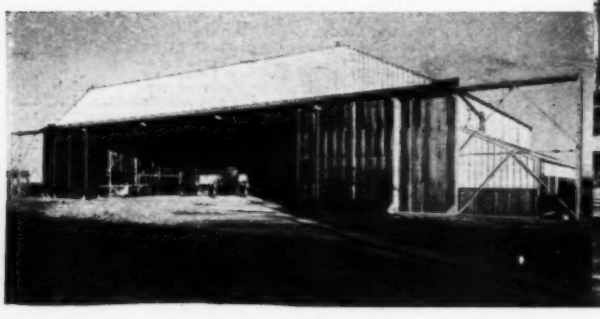
The history of this firm goes back to 1910, when Mr. John Wright and the late Mr. William Anderson joined forces to start the company in small premises in Abbot Street, Gateshead. By 1914 it was found that the site was inadequate, and a move was made to build a larger factory on the present site in Coulthard's Lane, Gateshead. In the intervening period the factory has been added to and extended in a manner which must have exceeded the wildest hopes of the founders. The original premises covered over 10,000 sq. ft. At the end of 1938 the works had been expanded to the extent that the total area covered by the overhead cranes alone amounted to over 100,000 sq. ft.

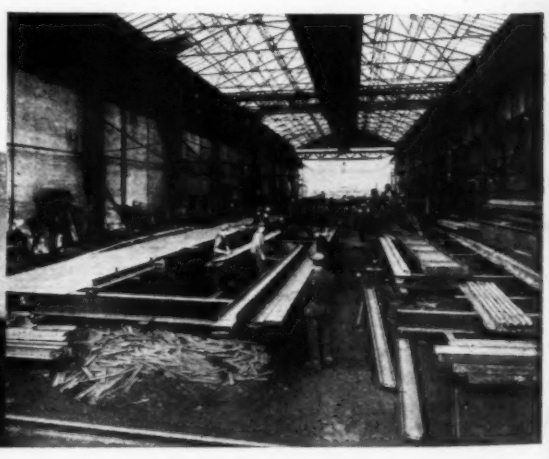
The works consist of two large bays, one of which is 70ft. wide and 40ft. high and over 300ft. in length. Fifteen-ton overhead cranes run down the length of the bays and extend outwards at both ends on runways. Outside, alongside special railway sidings, over 2,500 tons of material lies in the stock-yard, which is also equipped with overhead travelling cranes.

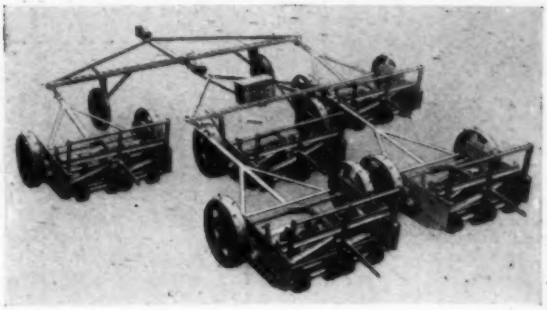
Conveniently near these vast workshops are situated the company's offices, modern and efficient in layout and organisation and equipped with well-lit drawing and estimating offices.

It is here that all types of steel construction are dealt with in the early stages. Across the yard in the two workshops the steel work is cut, drilled and riveted prior to test assembly and dismantling into sections convenient for transport—small wonder is it, therefore, that Wright, Anderson and Co. dealt with over 13,000 tons of fabricated steelwork last year.

Newcastle's Tyneside municipal airport at Woolsington has just been equipped with the imposing Wright, Anderson steel hangar, seen below. The sliding doors can be withdrawn beyond the limits of the hangar walls. (Right) Inside this 300ft. bay at the works of Wright, Anderson and Co., run two 15-ton overhead travelling cranes. Some idea of the steel-work for which the company is famed can be gained by the structure of the roof.







The Green gang mower described below.

For Aerodrome Mowing

ONE important firm must be added to those enumerated in *Flight* in connection with aerodrome maintenance, and that is Thomas Green and Son, Ltd., of Smithfield Ironworks, Leeds, 2, makers of gang and other mowers.

The Green mowers are of the rotary-cutter type and capable of being used in gangs of three, five, seven or nine interchangeable units each having a cutting width of 30in. The machines, it is stated, are capable of cutting satisfactorily any kind of grass, and special means have been adopted to prevent clogging by cut grass.

To describe the units briefly, side frames are of heavy mild-steel plate, strongly cross-braced to prevent twisting when being hauled over rough ground. The land wheels are pressed from steel plates, have wide treads, and are fitted with spikes to ensure a non-slip drive to the cutting cylinders. Gearing is of the spur type, and in addition to the speed gearing, there is an effective and simple differential gear and a clutch arrangement for rapidly putting the cutting cylinders in or out of gear. All gearing is totally enclosed in oil-retaining and dust-excluding cases, and the shafts run on ball bearings.

Each cutting cylinder has five cutters, so arranged that at least one cutter is always in contact with the bottom blade. The cutters are riveted to steel centres so that any single cutter is separately replaceable.

Means are provided for rapid adjustment of height of cut and for lifting the cylinder well clear of the ground when travelling over rough surfaces. This lifting gear is operated by a single lever giving a direct lift, and the various heights of cut are fixed by a spring-operated pin. The lowest cutting position is $\frac{3}{8}$in. from the ground. Draw-bars are so arranged that the varying height of the draw-bar hitch cannot cause any variation in the height of the cutting cylinder.

Airports, Ltd., Results

THE year's operating profit of Airports, Ltd., mentioned last week, was £39,693; the figure of £28,894 was the net profit.